BY APPOINTMENT TO
HER MAJESTY QUEEN ELIZABETH II
MANUFACTURERS OF DAIMLER AND JAGUAR CARS
JAGUAR CARS LIMITED COVENTRY

BY APPOINTMENT TO
HER MAJESTY QUEEN ELIZABETH
THE QUEEN MOTHER
MANUFACTURERS OF DAIMLER AND JAGUAR CARS
JAGUAR CARS LIMITED COVENTRY

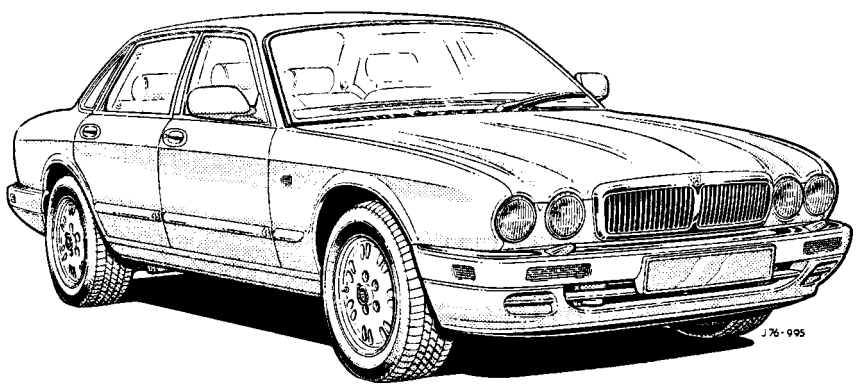
BY APPOINTMENT TO
HIS ROYAL HIGHNESS THE PRINCE OF WALES
MANUFACTURERS OF DAIMLER AND JAGUAR CARS
JAGUAR CARS LIMITED COVENTRY

JAGUAR

XJ6

Electrical Diagnostic Manual

(Cover 1)



Published by Product Development & Publications
Jaguar Cars Limited

Part of set – JJM 10 04 12 / 50

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ELECTRICAL DIAGNOSTIC MANUAL – INTRODUCTION

Preliminary information

- Manual structure
- Manual content
- How to use this manual

Preliminary Information

The following information details the structure of, and information contained in, the Electrical Diagnostic Manual (EDM). The manual is designed to provide diagnostic information on all major electrical systems fitted to 1995MY Sedan Vehicles. Where diagnostics require major component removal or overhaul, reference will be made to the relevant sections of the Vehicle Service Manual (VSM) and Unit Service Manuals (USM) as necessary.

Manual Structure

The manual structure is closely aligned to the VSM in both sectional arrangement and numbering. Each section of the EDM is intended to complement the corresponding VSM section by providing detailed diagnostic procedures designed to resolve faults which may be discovered during general maintenance or vehicle use.

Manual Content

Manual content consists of individual system sections each divided into the following subsections:

- System Description: A brief description of how each system operates, how faults are identified and logged and the location and function of each system component.
- Component Description: Detailed descriptions of each system component giving relevant data and specifications.
- Diagnostic Fault Codes: List of all fault codes with explanatory information and potential causes / remedies.
- Symptom Flow Charts: Logical 'flow diagram' type fault diagnosis, where applicable, or descriptive system testing.
- Diagnostic Sub-routines: Detailed information on specific areas identified in Symptom Flow Charts.
- Pin Point Tests: Exact locations of test points for faulty areas identified during fault diagnosis.

HOW TO USE THIS MANUAL

This manual is intended to be used in conjunction with the VSM to identify and correct electrical faults within the vehicle's systems. Each section is designed to explain and diagnose system faults in a logical, concise manner to reduce maintenance repair time. The method of extracting fault codes from the various electronic microprocessor modules vary between systems and each method is detailed in its section. All systems with fault codes conforming to CARB OBDII legislation have codes accessible by a hand-held scan tool. All system codes are accessible using Jaguar Diagnostic Equipment, ie Portable Diagnostic Unit.

The manual has been divided between three covers, as detailed below:

Cover	Section Number	Section Title
1	5.1	Fuel, Emission Control and Engine Management (AJ16)
2	5 2	Fuel, Emission Control and Engine Management (V12)
3	8.1	Automatic Transmission (AJ16)
3	8.2	Automatic Transmission (V12)
3	10	Steering
3	12	Brakes
3	14	Climate Control Systems
3	15	Electrical

Circuit diagrams are contained in cover 3, following Section 15.

An index to this manual can be found at the rear of cover 3.

GLOSSARY OF TERMS

Introduction

This glossary of terms is intended to cover both general and emissions-related (to SAE J 1930)terminology. It is intended to enable the user to ascertain the meaning of standardized terms and acronyms used throughout the Manual. The required term may be looked-up in the left-hand column, and subsequent columns give the standard abbreviation or acronym, definitions and previously used terms, as applicable.
As this Manual is a world-wide publication, and must comply with certain Society of Automotive Engineers Standards, it has been necessary to adopt the terminology etc. demanded by that Standard.

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
A			
accelerator pedal	AP		throttle pedal
across flats	AF	measurement across the spanner flats of a nut or bolt head	
adapter			adaptor
after bottom dead center	ABDC	event occurring after BDC	
after top dead center	ATDC	event occurring after TDC	
Airbag / Supplementary Restraint System	AIRBAG / SRS	airbag restraint system for driver and front seat passenger	AIRBAG / SRS
Air Cleaner	ACL		
Air Conditioning	A/C		AC, aircon
Air Conditioning Signal	ACS	air conditioning compressor clutch operation is signalled to the PCM which induces idle speed corrections to compensate for engine load changes	
Air Conditioning Control Module	A/CCM	module controlling air conditioning, heating and ventilation	
airfoil		wing or similar, designed to obtain some effect from the flow of air over it	aerofoil
alternating current	ac	electrical current whose flow alternates in direction, in a sinusoidal wave-form	
aluminum			aluminium
Ambient temperature		Temperature of the air surrounding an object	
Ampere	A	SI unit of current	Amp
Ampere hour	Ah	1 Ampere flowing for one hour	Amp. hour
Anti-Lock Braking System	ABS	system, usually electronically controlled (but can be mechanically) which prevents wheel lock-up under braking by sensing lack of rotation of a wheel(s) and diverting fluid pressure away from it (them). Originally *Anti-Blockier System* (Bosch).	
ABS control module	ABS CM		
ABS / traction control control module	ABS / TC CM		
antenna (plural, antennae or antennas)			aerial
analog			analogue
Analog Volt-Ohm meter	AVOM		
atmospheres	atm	unit of pressure (1.01325 bar)	
automatic transmission			auto, auto gearbox
axle shaft		shaft transmitting power to the rear wheel hubs	drive shaft

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
Babbitt metal			white metal
backlight			backlight, rear screen
back–up lamp			reversing lamp
balk ring		rotating component of manual transmission which prevents premature engagement of gears	baulk ring
battery positive Voltage	B+	The positive Voltage from a battery or any circuit connected directly to it.	B+, +ve, VSS
Barometric Absolute Pressure Sensor	BARO	sensor measuring the pressure of surrounding air at any given temperature and altitude	BARO, APS
base Idle		Idle rpm determined by the throttle lever being hard–set on the throttle body with the IAC solenoid disconnected	
base timing		Spark advance in degrees before top dead center of the base engine without any control from the PCM	
battery		Electrical storage device producing DC Voltage by means of electrochemical reaction	
before bottom dead center	BBDC	event occurring before BDC	
before top dead center	BTDC	event (usually ignition) occurring before TDC	
blower	BLR	Device which supplies a current of air at moderate pressure, e.g. heater or A/C blower	
Body Processor Module	BPM	Control module for body electrical systems, e.g. interior lamps, windshield wash / wipe control etc..	CCM (Central Control Module). CPU
British Standards	BS	standard specification issued by the British Standards Institution	
British Standards Automotive	BSAu		
brake horsepower	bhp	effective horsepower developed by an engine or motor, as measured by a brake applied to its output shaft	
brake mean effective pressure	BMEP	that part of the effective pressure developed in a cylinder that would result in a cylinder output equal to the bhp of the engine	
brake on/off	BOO	indicates the position of the brake pedal	
brake rotor			brake disc
break–in, breaking–in, wearing–in		process of bedding–in the internal working surfaces of e.g. an engine by avoiding excess build–up of heat	running–in
bottom dead center	BDC	lowest point of piston travel in a reciprocating engine	
bypass air	BPA	mechanical control of throttle bypass air	
bumper guard			overrider
bushing		cylindrical plain bearing	bush

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GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
C			
camshaft		a shaft on which phased cams are mounted. Usually used to regulate opening and closing of engine cylinder head valves	
Camshaft Position	CMP		
Camshaft Position Sensor	CMPS	indicates camshaft position	CID sensor, **Hall** sensor
canister		device designed to hold dry material, e.g. evaporative emission canister	
Canister Purge	CANP	controls purging of the EVAP canister	
Carbon Dioxide	CO_2	colorless gas with a density of approximately 1.5 times that of air	
Carbon Monoxide	CO	poisonous gas produced as the result of incomplete combustion	
Case Ground	CSE GND	Control module casing ground	
camber		inclination of the plane of a wheel to the vertical plane of the vehicle. May be negative or positive. Also convex curvature across road surface	
Canadian Motor Vehicle Safety Standard	CMVSS		
caster		trail built in to the geometry of a steered roadwheel to give it a caster – self–steering – effect	caster, castor
Catalytic Converter		in–line exhaust system device used to reduce the level of engine exhaust emissions	
Celsius	C	SI term for the Centigrade scale, with freezing point at zero and boiling point at **100°**	
center			centre
centimeters	cm		centimetres
charge current		current developed by the generator	charging current
Closed Loop	CL		
Closed Loop System	CLS	control system with one or more feedback loops	
Clutch		device which uses mechanical, magnetic or friction type connections to facilitate engaging or disengaging two shafts or rotating members	
clutch disc, clutch disk		friction disc of a clutch assembly	clutch plate, centre plate, driven plate
clutch throwout bearing		bearing mounted on clutch throw-out fork, which depresses the pressure plate's diaphragm spring to release the clutch disc	clutch release bearing
color			colour
column/mirror control module	C/M CM		
connecting rod bearing		bearing (usually split, plain) at the lower end of the connecting rod where it connects with the crankshaft	big end bearing

GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
Control		a means or device to direct and regulate a process or guide the operation of a machine, apparatus or system	
Control Module	CM	a self-contained group of electrical/electronic components, designed as a single replaceable unit, and controlling one or more processes as above	
convertible top		flexible, usually fabric, roof of an open (convertible) vehicle	hood, convertible hood
countershaft		shaft, carrying pinions, running parallel to the mainshaft in a transmission unit	layshaft
cotter pin		split pin which is used as a locking device for a castellated nut, etc.	split pin, cotter pin
Crankshaft Position	CKP		
Crankshaft Position Sensor	CKPS	generates crankshaft position information in conjunction with the CKPTR (also generates speed information in certain applications)	
Crankshaft Position Timing Ring	CKPTR	toothed ring which triggers the CKPS	
Crankcase Ventilation System	CV	system which scavenges camshaft cover and crankcase emissions and feeds them into the inlet manifold.	
cubic centimeters	cm^3		cubic centimetres
curb weight		weight of vehicle with fuel, lubricants and coolant, but excluding driver, passengers or payload	kerb weight
cylinder sleeve, sleeve		thin-walled, hard metal cylinder inserted into the cylinder block of an engine, and in which the piston runs	cylinder liner

GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
D			
downshift			change down
draft			draught
drivability			driveability
driveshaft		longitudinal shaft transmitting power from transmission output to rear axle differential	propeller shaft
driveshaft tunnel		tunnel in floor above the driveshaft (propeller shaft)	transmission tunnel
dry sleeve		cylinder sleeve which is not in contact with coolant	dry liner
Dual Overhead Cam	DOHC	engine configuration with two camshafts positioned above the valves	
Data		*(US)* Fact or group of facts.	(English) Group of facts (i.e. plural of *datum*)
Data Link Connector	DLC	connector providing access and/or control of the vehicle information, operating conditions, and diagnostic information	
Data Output Line	DOL	circuit that sends certain information from the PCM to the instrument cluster	
defogger, backlight defogger			HRW, rear screen heater, demister
degree (angle or temperature)	deg, °		
Department of Transportation (US)	DOT		
Department of Transport (UK)	DTp		
Deutsche Institut fur Normung	DIN	German Standards regulation body	
diameter	dia		
Diagnostic Module	DM	Supplemental Restraint System (non-controlling) module for diagnostics overview	
Diagnostic Test Mode	DTM	a level of capability in an OBD system. May include different functional states to observe signals, a base level to read DTCs, a monitor level which includes information on signal levels, bi-directional control with on/off board aids, and the ability to interface with remote diagnosis	Self Test Mode
Diagnostic Trouble Code	DTC	an alpha/numeric identifier for a fault condition identified by the On-Board Diagnostic (OBD) system	Self Test Code. Fuel Fail code
differential housing		rotating housing (in a bevel differential) attached to the crownwheel, carrying the final drive pinions	differential cage
differential pressure		pressure difference between two regions e.g. between intake manifold and atmospheric pressures	
Differential Pressure Feedback EGR	DPFE	an EGR system that monitors differential EGR pressure across a remote orifice to control EGR flow	
dimmer switch			dip switch, dipper switch

Term(s)	Abbreviation	Definition	Previously used term(s) (or English Equivalent)
direct current	dc	current which flows in one direction only, though it may have appreciable pulsations in its magnitude	
disk, disc			disc
Distributor Ignition	DI		distributor
Distributor Ignition Cap	DIC		distributor cap
Distributor Ignition Carbon Brush	DICB		distributor carbon brush
Distributor Ignition Leads	DIL		distributor leads
Distributor Ignition Rotor Arm	DIRA		distributor rotor arm

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GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
E			
Exhaust Gas Recirculation	EGR	System which reduces NOx emissions by adding exhaust gases to the incoming fuel/air charge	EGR
EGR Temperature EGRT Sensor	EGRT	Sensing EGR function based on temperature change.	
EGR Vacuum Regulator	EVR	controls EGR flow by changing vacuum to the EGR valve	
EGR Valve Position	EVP	an EGR system that directly monitors EGR valve position to control EGR flow	
Electrical Diagnostic Manual	EDM	Manual which deals with the diagnosis of electrical faults (see also Vehicle Service Manual and Unit Service Manual)	
Electrically Erasable Programmable Read–Only memory	EEPROM		EEPROM, E2PROM
Electrically Programmable Read–Only memory	EPROM		EPROM
Electronic Engine Control	EEC	a system that provides electronic control of engine electronics	
Electronic Secondary Air Injection	EAIR	a pump-driven system for providing secondary air using an electric air pump	
Engine Control Module	ECM		ECU
Engine Coolant Level	ECL		engine coolant level indicator
Engine Coolant Temperature	ECT		
ECT Sensor	ECTS	thermistor which provides engine coolant temperature signal to the PCME to trigger enrichment circuits which increase injector 'on' time for cold start and warm–up	Coolant temp. sensor, ECT
Engine Speed	RPM		rev/min, RPM
Engine Speed Sensor		sensor fitted on flywheel of V12 engine; provides engine speed information	
Environmental Protection Agency	EPA		
Evaporative Emission	EVAP	system designed to prevent fuel vapor from escaping into the atmosphere. Typically includes a charcoal filled canister to absorb fuel vapor	
Evaporative Emission Control Valve	EVAPP		purge valve
Exhaust Gas Recirculation Solenoid Vacuum Valve	EGRS		EGR solenoid valve
Exhaust Gas Recirculation Temperature Sensor	EGRT Sensor		EGR temperature sensor
Exhaust Gas Recirculation Valve	EGRV		
Extreme Pressure	EP	additives to drive axle lubricants. Designed to protect the spiral bevel gears from wear induced by their sliding/rolling action	

GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
Fan Control	FC	engine cooling fan control	
Fascia			fascia, facia
farad	F	SI unit of electrostatic capacitance; more usually subdivided to microfarad	
Federal Motor Vehicle Safety Standard (US)	FMVSS		
fender			wing, (also tonneau)
			fibre
firewall			bulkhead, dash panel
Flash Electrically Erasable Programmable Read-only Memory	FEEPROM		
Flash Erasable Programmable Read-only Memory	FEPROM		
Flywheel Sensor	CKFS	sensor mounted so as to be triggered by each flywheel ring gear tooth to give an engine speed signal	flywheel sensor
fueling			fuelling
Fuel Injectors	FI	solenoid operated devices that spray a metered quantity of fuel into the inlet ports	fuel injectors, injectors
Fuel Pressure Regulator Control	FPRC	controls fuel pressure regulator; used primarily to give extra fuel at cold start-up	
Fuel Pump	FP		
Fuel Pump Monitor	FPM	monitors operation of fuel pump	
Fuel Pump Relay	FPR		
fuel rich/lean		qualitative evaluation of air/fuel ratio based on a ratio known as stoichiometry, or 14.7:1 (Lambda)	

GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
G			
gauge (gage also used, but not preferred)			gauge
gasoline			petrol, petroleum spirit
gas tank			petrol tank, fuel tank
gear cluster			layshaft
gearshift (lever), shift lever			gear lever
generator	GEN	rotating machine which converts mechanical energy into electrical energy	alternator
Gramme centimeter	gcm		
Grammes (force)	gf		
Grammes (mass)	g		
ground	GND	electrical conductor used as a common return for an electrical circuit or circuits, and with a relative zero potential	earth

GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
H			
Hall Effect		process where current is passed through a small slice of semi-conductor material at the same time as a magnetic field. Produces a small voltage in the semi-conductor	
hard fault		a fault currently present in the system	
headlamp	HL		
Heated Oxygen Sensor	HO2S	electrically heated oxygen sensor which induces fueling corrections.	Lambda sensor, HEGO, HOS
heavy duty	HD		
Hertz (frequency)	Hz	frequency, one cycle per second	
High Mounted Stoplamp	HMSL		
high tension (electrical)	ht		
hood			bonnet
hose clamp			hose clip
hour	hour		h, hr
hydrocarbon	HC		
hydroplaning			aquaplaning

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GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
I			
Idle Air Control	IAC	electrical control of throttle bypass air	
Idle Air Control Valve	IACV	stepper motor driven device which varies the volume of air by-passing the throttle to maintain the programmed idle speed	idle speed control actuator, idle air bypass control, idle speed control valve
ignition amplifier	IA	device which amplifies the ignition system output	
ignition ground	IGN GND		
Inertia Fuel Shut-off	IFS	an inertia system that shuts off the fuel supply when activated by predetermined force limits brought about by (e.g.) collision	
Inertia Fuel Shut-off Switch	IFSS	shuts down fuel and ignition systems in the event of a vehicle impact	inertia switch
intake			inlet
Intake Air		air drawn through a cleaner and distributed to each cylinder for use in combustion	
Intake Air Temperature	IAT	temperature of intake air	
Intake Air Temperature Sensor	IATS	device used to measure IAT	ACT, air temperature sensor, MAT, ATSD. VAT. TBT
Intake Air Temperature Sensor Ignition	IATSI	thermistor which signals the ECM to retard the ignition timing in response to high inlet air temperatures	
Intake Air Temperature Sensor Injection	IATSF	thermistor which inputs air density information to the ECM	
internal diameter	i.dia		
International Standards Organization	ISO		
interrupter			interruptor
J			
jumper cable			jump lead

GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
K			
kilogrammes (mass)	kg		
kilogrammes (force)	kgf		
kilogrammes force per square centimeter	kgf/cm^2		
kilometers	km		kilometres
kilometers per hour	km/h		km/h, kph
kilopascals	kPa		
kilovolt	kV		
knock		the sharp metallic produced sound when two pressure fronts collide in a combustion chamber (see also ping)	
knock sensor	KS	sensor which detects the onset of detonation and signals the ECM to retard the ignition	
L			
lash		free play, end-float	play
left-hand	LH		
left-hand drive vehicle	LHD		
left-hand thread	LH Thd		
leveling			levelling
license			licence
license plate			registration plate, number plate
liquid crystal display	LCD	optical digital display system, applied voltage to which varies the way the crystals reflect light, thereby modifying the display	
Liter	L		Litre
louver			louvre
lowered beam			dipped beam
low tension	lt	primary circuit of the ignition system, linking the battery to the primary winding in the ignition coil	
lug nut			wheel nut

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GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
M			
Malfunction Indicator Lamp	MIL	a required on-board indicator to alert the driver of an emission related malfunction	fuelling failure
Manifold Absolute Pressure	MAP	absolute pressure of the intake manifold air	
Manifold Absolute Pressure Sensor	MAPS	sensor located in the PCM and ported to the intake manifold	
Manifold Surface Temperature	MST		
manual transmission, transmission	M/T	transmission which is manually, externally controlled	gearbox
Mass Air Flow	MAF	system which provides information on the mass flow rate of the intake air to the engine	
Mass Air Flow Sensor	MAFS	hot-wire sensor which monitors air flow into the intake manifold for fueling and ignition control	air flow meter
maximum	max.		
metal inert gas	MIG	electric welding system in which a stream of inert gas shields the electrode, preventing oxidation	
meters (measurement)	m		metres
metric (screw thread, e.g. M8)	M		
Microfarad	MFD	unit of electrical capacitance, one millionth of a farad	
millimeters	mm		
millimeters of mercury	mmHg		
minimum	min.		
minute	minute		min.
Model Year	MY		
Module	M	self contained group of electrical/electronic components which is designed as a single replaceable unit	
mold			mould
Motorized In-Car Aspirator	MIA	device which constantly samples cabin temperature by passing air over a sensor, and communicates with the A/CCM to modify A/C system performance to suit	motorized aspirator
muffler		device which causes exhaust gas flow to expand and thereby reduce its pressure and hence its noise	silencer
multiport fuel injection	MFI		

GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
N			
National Institute of Occupational Safety & Health (US)	NIOSH		
Newton	N	SI unit of force. 1 N = 0.2248 pounds force	
Newton meters	Nm	SI unit of torque. Must not be confused with nm (nanometer)	
Nitrous Oxides	NOx	compounds of nitrogen and oxygen formed at high temperatures. Major source of exhaust-gas air-pollution	
Non-Volatile Random Access Memory	NVRAM	RAM which retains memory even if power supply is interrupted	
normally aspirated		fueling system using intake air at atmospheric pressure; not supercharged or turbocharged	
Normally Closed	NC		
Normally Open	NO		
North American Specification	NAS	vehicles for sale in the USA and Canadian markets	
number	No.		
O			
octane number		measure of the anti-knock properties of a fuel	
Occupational Safety & Health Administration (US)	OSHA		
odometer		instrument which records the total mileage covered by a vehicle	mileometer
oil gauge, oil gage			dipstick
oil pan			sump, oil sump
oil passage			oilway
On-Board Diagnostic	OBD	a system that monitors some or all computer input and output control signals. Signal(s) outside the pre-determined limits imply a fault in the system or a related system	
open circuit		a circuit which does not provide a complete path for flow of current	
original equipment manufacturer	OEM		
outside diameter	o. dia		
overhead camshaft	OHC	engine configuration with single camshaft positioned above the valves	
Oxidation Catalytic Converter	OC	catalytic converter system that reduces levels of HC and CO	cat, OC
oxides of nitrogen	NOx		
Oxygen Sensor	O2S	a sensor which detects oxygen content in the exhaust gases	EGO, 02 EOS, EGS, *OS,* EGOS, Lambda Sensor

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GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
P			
paragraph	para		
parking brake			handbrake
Park Neutral Position	PNP		
Park Neutral Position Switch	PNPS	indicates the selected non-drive modes of the (automatic) transmission	NDS, **NGS,** TSN, gearbox sensor
part number	**part no.**		
pin boss		boss in the piston wall (two per piston) which is bored to accept one end of the piston pin	piston pin boss
ping, pinging		metallic pinging sound caused by detonation in the combustion chamber, usually caused by incorrect grade of fuel (too low octane) or over-advanced ignition timing (see also ***knock)***	pinking
piston pin ***(also*** wrist ***pin)***		pin which connects the connecting rod to the piston, and permits articulation between the two.	gudgeon pin
power assisted steering		hydraulic pump-assisted steering system	power steering
power steering pressure			
powertrain		the elements of a vehicle by which motive power is generated and transmitted to the driven axle	drive line
		sequence of events to be performed by a control module/computer	programme, program
programable or programmable			**programmable**
programed or programmed			**programmed**
programer or programmer			**programmer**
programing or programming			programming
Programmable Electronic Control Units System	PECUS	process whereby a common ECM is programmed on the production line to suit the market requirements of a particular vehicle	
Programmable Read-only Mem-	**PROM**	ROM with some provision for setting the stored data after manufacture	
Prussian blue			engineer's blue
		device used to raise, transfer, or compress fluids by suction, pressure or both	
purge cock			drain plug, drain **tap**

GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
Q			
R			
Radio Data System	RDS	local traffic information service which automatically breaks in to whichever station is being received. Also programmable to lock onto the strongest available frequency for a given nationally available radio station, regardless of the geographical location of the receiver	
Random Access Memory	RAM	fast access memory store which is accessible for entry or extraction of data	
Read-Only Memory	ROM	fast access memory in which data is fixed and may not be entered or extracted	
rear wheel drive	RWD		
relay		an (usually) electro-mechanical device in which connections in one circuit are opened or closed by changes in another circuit	
relay module	RM	a module containing two or more relays	
reservoir	RES	container, usually for oils, coolants or hydraulic fluids	
return	RTN	a dedicated sensor ground circuit	
revolutions per minute	RPM	shaft-speed of a device, usually an engine or motor	
right-hand	RH		
right-hand drive vehicle	RHD		
rocker panel			door sill, sill
roof lining			head lining

GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
S			
Scan Tool	ST	device that interfaces with and communicates information on a data link	
Seat Control Module	SCM	module controlling the seat motor systems (not electric raise/lower–only seats)	
Secondary Air		air provided to the exhaust system	
Secondary Air Injection	AIR	system used for a period of time each time the engine is started, unless certain temperature criteria are met. Pumps air directly into the exhaust system which generates extra heat and reduces the time taken for the catalytic converters to reach operating temperature	AIP, AI, Thermac, air injection system
Secondary Air Injection Bypass	AIRB	vents secondary air to atmosphere	
Secondary Air Injection Check Valve	AIRC	valve which prevents back–flow of exhaust gas to the AIR system when the system is inoperative	NRV, non–return valve
Secondary Air Injection Diverter	AIRD	diverts secondary air to either the catalyst or exhaust manifold	
Secondary Air Injection Magnetic Clutch	AIRPC	clutch mounted on the AIRP drive shaft	air pump clutch
Secondary Air Injection Pump	AIRP	mechanically driven rotary vane pump, driven through the AIRPC	AIP, air pump
Secondary Air Injection Relay	AIRR	controls the injection of air into the exhaust system	air injection relay
Secondary Air Injection Switching Valve	AIRS	vacuum operated valve backing–up the AIRC	air switching valve
Security & Locking Control Module	SLCM	module controlling the vehicle's security and closure–locking functions	
sedan		passenger car having two or four doors, and front and rear seats for driver and passengers	saloon
Sensor	S	generic name for a device that senses either the absolute value or a change in a physical quantity such as temperature, pressure or flow rate, and converts that change into an electrical quantity signal	
Service Bulletin	SB		
Service Manual	SM		
Service Manual Preliminary Information Bulletin	SMPIB	form of Service Bulletin specifically designed to enable the rapid issue of temporary pages for inclusion in the Service Manual	
Service Repair Operation (number)	SRO	Number generated by Jaguar Methods & Techniques system which relates to the time allowed to complete a repair operation. Further information on the system can be found in the separate Jaguar Publications (for each model range) entitled 'Repair Operation Times'.	

GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously *used* term(s) (or English Equivalent)
shift fork		part of the shift mechanism of a manual transmission, mounted on the shift rail, and relaying movement in the shift lever to the sleeve coupling which moves gears in and out of engagement	selectorfork
shift rail		rail which carries the shift fork	selector rod
shift solenoid	SS	controls shifting in an automatic transmission	
short block		part engine, usually the cylinder block, crankshaft / connecting rod / piston assembly, supplied as a reconditioned unit	short engine
short circuit		an undesirable connection between a (usually electrical) circuit and any other point	
slant engine		in-line engine which is mounted in the vehicle at an angle from the perpendicular, as AJ6	inclined engine
sliding roof			sun roof
sliding roof control module	SRCM		sun roof control module
signal return	SIG RTN		
snap ring			circlip
snubber		buffer block, usually of a rubber compound, which fits between the axle and the body unit, and absorbs any excess travel	bump stop
Society of Automotive Engineers	SAE		
solenoid		device consisting of an electrical coil which, when energized, produces a magneticfield in a plunger which is pulled to a central position. A solenoid may be used as an actuator in a valve or switch	
splash guard			mud flap
speed		the magnitude of velocity (regardless of direction)	
Speed Control Control Module	SCCM	Module controlling Speed Control System	Cruise Control Module (CCM)
square centimeters	cm^2		
stabilizer bar		torsion bar across the vehicle, connecting body and suspension	anti-roll bar
standard	std		
station wagon			estate car, shooting brake
stop lamp			brake lamp
sulfur, sulfuric			sulphur, -ic
supercharger	SC	an intake system which utilizes a supercharger (mechanically driven device that pressurizes intake air, thereby increasing density of charge air and the consequent power output from a given displacement)	
Supercharger Bypass	SCB		
supply port	SP	supply port of valve	

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GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
switch		device for making, breaking or changing the connections in an electrical circuit	
synchromesh	synchro	manual transmission mechanism consisting of a cone shaped clutch inside a coupling sleeve which ensures that the sleeve and the gear are turning at the same speed as they mesh	
system		group of interacting mechanical or electrical components serving a common purpose	

GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
tachometer	TACH	a circuit that provides input for an electronic tachometer display	
Thermal Vacuum Valve	TVV	controls vacuum levels or routing based on temperature	
Three-way Catalytic Converter	TWC	catalytic converter that reduces the levels of HC, CO & NOx	cat
Three–way + Oxidation Catalytic Converter	TWC + OC	catalyticconverter system that has both TWC and OC. Usually secondary air is introduced	cat, dual bed
		product is measured under various conditions	
Throttle		a valve for regulating the supply of a fluid, usually air or an air/fuel mixture, to an engine	
Throttle Body	TB	device containing the throttle	
Throttle Position	TP		
Throttle Position Sensor	TPS	interprets throttle position and movement to identify idle, acceleration and full–power demands	Throttle potentiometer, TPS, TP
throw–out bearing			clutch release bearing
throw–out fork			clutch release lever
tie–rod (steering)			track rod
timing		relationship between spark plug firing and piston position, usually expressed in crankshaft degrees BTDC or ATDC of the compression stroke	
tire			tyre
top dead center	TDC		
torque converter		device which, by its design, multiplies the torque in a fluid coupling between an engine and transmission	
Torque Converter Clutch	TCC		TCC, CCC, CCO, LUS, MLUS, MCCC
Transmission		device which selectively increases or decreases the ratio of relative rotation between its input and output shafts	
Transmission Control Module	TCM	controls the shifting pattern of the (automatic) transmission	transmission ECU
Transmission Control Switch	TCS	Modifies the operation of electronically controlled transmissions	
Transmission Oil Temperature	TOT	indicates temperature of transmission fluid	
Transmission Range	TR	the range in which the transmission is operating	
Transmission Speed Sensor	TSS	indicates rotational speed of transmission output shaft or turbine shaft	
tread		track between tire contact centers; not to be confused with tire contact tread pattern	track
trunk			boot, luggage compartment
turn indicator, turn signal lamp			direction indicator
two cycle		principle of engine which fires every second stroke of the piston	two stroke

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GLOSSARY OF TERMS

Term(s)	Abbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
U			
undercoating			underseal
unitized construction			unitary construction
Unit Service Manual	USM	Service Manual which pertains to a major 'unit' (e.g. transmission, engine) fitted to a Jaguar vehicle (see also Vehicle Service Manual and Electrical Diagnostic Manual)	
V			
valve		a device by which the flow of liquid, gas, vacuum or loose materials may be started, stopped or regulated by a movable part which opens, shuts or partially obstructs one or more passageways or ports. A 'Valve' is also the movable part of such a device	
valve lifter		in an OHC engine, the plunger fitted between valve stem and cam lobe	tappet, bucket
vapor			vapour
Vehicle Condition Monitor	VCM	instrument panel display which warns of faults	
Vehicle Emission Control Information Label	VECI Label		
Vehicle Service Manual	VSM	Service Manual which pertains to a specific family of Jaguar vehicles (see also Unit Service Manual and Electrical Diagnostic Manual).	
Vehicle Speed Sensor	VSS	sensor which provides vehicle speed information	road speed sensor
Vehicle Identification Number	VIN	number assigned to the vehicle by the manufacturer, primarily for licensing and identification purposes	
Viscosity Index	VI		
volatile		(1) vaporizing at room temperature (liquid) (2) not permanent (memory)	
Voltage Regulator	VR	device which regulates the variable output voltage of a generator	

GLOSSARY OF TERMS

Term(s)	Arbbreviation (if applicable)	Definition	Previously used term(s) (or English Equivalent)
Warm–up Oxidation Catalytic Converter	WU–OC	catalytic converter system designed to lower HC and CO emissions during the warm–up period. Usually located in or near the exhaust manifold	
Warm–up Three–way Catalytic Converter	WU–TWC	catalytic converter system designed to lower HC, CO and NOx emissions during the warm–up period. Usually located in or near the exhaust manifold	
watts	W	SI unit of power (1 hp = 745.7 watts)	
wet sleeve		thin walled hard metal cylinder supported at cylinder head and crankshaft ends; in contact with coolant	wet liner
wheelslip			wheelspin
Wide Open Throttle	WOT	full throttle position	
windshield			windscreen
wrist pin (also *piston* pin)		pin which connects the connecting rod to the piston, and permits articulation between the two.	gudgeon pin
XYZ			

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Note: **Due to the complexity of component diagnostics the symptom charts / pin point tests have been collated in group and 'P' code order; their listing commences on page ii.**

DIAGNOSTIC FAULT CODES

FUEL AND AIR METERING

			Page no.	Diagnostic chart page no.
GROUP 1	**MASS AIR FLOW SENSOR - MAFS**	**MIL**	13	
P0101	MAF circuit range / performance	Y		85
P0102	MAF circuit low input	Y		86
P0103	MAF circuit high input	Y		87
	Remove / Refit		16	
GROUP 2	**INTAKE AIR TEMPERATURE - IAT**		17	
P0112	IAT circuit low input	Y		88
P0113	IAT circuit high input	Y		88
	Remove / Refit		19	
GROUP 3	**ENGINE COOLANT TEMPERATURE - ECT**		20	
P0116	ECT circuit range / performance - falling temperature	Y		89
P0117	ECT circuit low input	Y		90
P0118	ECT circuit high input	Y		91
P0125	Excessive time to enter closed loop fuel control	Y		92
	Remove / Refit		24	
GROUP 4	**THROTTLE POSITION - TP**		25	
P0121	**TP** circuit range / performance	Y		93
P0122	**TP** position circuit low input	Y		94
P0123	TP position circuit high input	Y		95
	Remove / Refit		28	
GROUP 5	**HEATED OXYGEN SENSOR - HO2S**		29	
	Bank 1 Sensor 1			
P0131	0 2 sensor circuit low voltage	**Y**		96
P0132	0 2 sensor circuit high voltage	**Y**		97
P0133	0 2 sensor circuit slow response	***Y***		98
	Bank 1 Sensor 2			
P0137	0 2 sensor circuit low voltage	**Y**		99
P0138	0 2 sensor circuit high voltage	**Y**		100
P0139	0 2 sensor circuit slow response	**Y**		101
P 1137	Lack of 0 2 switch, indicates lean	**Y**		102
P 1138	Lack of 0 2 switch, indicates rich	**Y**		103
	Bank 2 Sensor 1			
P0151	0 2 sensor circuit low voltage	**Y**		96
P0152	0 2 sensor circuit high voltage	**Y**		97
P0153	0 2 sensor circuit slow response	**Y**		98
	Bank 2 Sensor 2			
P0157	0 2 sensor circuit low voltage	**Y**		99
P0158	0 2 sensor circuit high voltage	**Y**		100
P0159	0 2 sensor circuit slow response	**Y**		101
P 1157	Lack of 0 2 switch, indicates lean	**Y**		102
P 1158	Lack of 0 2 switch, indicates rich	**Y**		103
	Remove / Refit		34	

5.1

			Page no.	Diagnostic chart page no.
GROUP 6	**ADAPTIVE FUEL**	**MIL**	35	
P 0171	System too lean – bank 1 – reduced flow	**Y**		104
P 0172	System too rich – bank 1 – excess flow	**Y**		105
P 0174	System too lean – bank 2 – reduced flow	**Y**		104
P 0175	System too rich – bank 2 – excess flow	**Y**		105
P 1171	Lean fuelling – banks 1 & 2	**Y**		106
P 1172	Rich fuelling – banks 1 & 2	**Y**		108
P 1176	Lean fuelling trim, long term (FMFR)	**Y**		109
P 1177	Rich fuelling trim, long term (FMFR)	**Y**		110
P 1178	Lean fuelling trim, long term (AMFR)	**Y**		111
P 1179	Rich fuelling trim, long term (AMFR)	**Y**		111
GROUP 7	**HEATED OXYGEN SENSOR – HO2S (HEATER)**		38	
	Banks 1 & 2 Sensor 1			
P 1185	0 2 sensor heater o/c	Y		112
P 1186	0 2 sensor heater s/c	Y		113
P 1187	0 2 sensor heater – o/c – inferred	Y		114
P 1188	0 2 sensor heater – resistance	Y		115
P 1189	0 2 sensor heater circuit low resistance	Y		116
P 1190	0 2 sensor heater – low resistance	Y		117
	Banks 1 & 2 Sensor 2			
P 1191	0 2 sensor heater o/c	Y		118
P 1192	0 2 sensor heater s/c	Y		119
P 1193	0 2 sensor heater – o/c – inferred	Y		120
P 1194	0 2 sensor heater – resistance	Y		121
P 1195	0 2 sensor heater circuit low resistance	Y		122
P 1196	0 2 sensor heater downstream – low resistance	Y		123
GROUP 8	**FUEL LEVEL**			
P 1199	Fuel level input circuit (This group is not active)	N		
GROUP 9	**INJECTOR – FI**		43	
P 0201	Injector circuit – cylinder 1	**Y**		124
P 0202	Injector circuit – cylinder 2	**Y**		–
P 0203	Injector circuit – cylinder 3	**Y**		–
P 0204	Injector circuit – cylinder 4	**Y**		–
P 0205	Injector circuit – cylinder 5	**Y**		–
P 0206	Injector circuit – cylinder 6	**Y**		–
P 1201	Injector o/c or s/c cylinder 1	**Y**		125
P 1202	Injector o/c or s/c cylinder 2	**Y**		–
P 1203	Injector o/c or s/c cylinder 3	**Y**		–
P 1204	Injector o/c or s/c cylinder 4	**Y**		–
P 1205	Injector o/c or s/c cylinder 5	**Y**		–
P 1206	Injector o/c or s/c cylinder 6	**Y**		–
	Remove / Refit		45	

IGNITION SYSTEM

			Page no.	Diagnostic chart page no.
GROUP 10	**MISFIRE**	**MIL**	47	
P 0300	Random misfire detected	N		126
P 0301	Misfire detected – cylinder 1	N		127
P 0302	Misfire detected – cylinder 2	N		–
P 0303	Misfire detected – cylinder 3	N		–
P 0304	Misfire detected – cylinder 4	N		–
P 0305	Misfire detected – cylinder 5	N		–
P 0306	Misfire detected – cylinder 6	N		–
P 1313	Misfire rate, catalyst damage – bank 1	N		129
P 1314	Misfire rate, catalyst damage – bank 2	N		129
P 1315	Persistent misfire	N		131
P 1316	Misfire rate above limit	N		131
GROUP 11	**KNOCK SENSOR 1 – KS 1**		49	
P 0326	KS 1 circuit range / performance	Y		133
P 0327	KS 1 circuit low input	Y		134
P 0328	KS 1 circuit high input	Y		135
	KNOCK SENSOR 2 – KS 2			
P 0331	KS 2 circuit range / performance	Y		133
P 0332	KS 2 circuit low input	Y		134
P 0333	KS 2 circuit high input	Y		135
	Remove / Refit		52	
GROUP 12	**CRANKSHAFT POSITION SENSOR – CKP**		53	
P 0335	CKP circuit	Y		136
P 0336	CKP circuit range / performance	Y		137
	Remove / Refit		54	
	CAMSHAFT POSITION SENSOR – CMP		55	
P 0340	CMP circuit	Y		138
GROUP 13	**IGNITION COILS**		57	
P 1361	Ignition coil cylinder 1 – no activation	Y		139
P 1362	Ignition coil cylinder 2 – no activation	Y		–
P 1363	Ignition coil cylinder 3 – no activation	Y		–
P 1364	Ignition coil cylinder 4 – no activation	Y		–
P 1365	Ignition coil cylinder 5 – no activation	Y		–
P 1366	Ignition coil cylinder 6 – no activation	Y		–
P 1371	Ignition coil cylinder 1 – early activation	Y		140
P 1372	Ignition coil cylinder 2 – early activation	Y		–
P 1373	Ignition coil cylinder 3 – early activation	Y		–
P 1374	Ignition coil cylinder 4 – early activation	Y		–
P 1375	Ignition coil cylinder 5 – early activation	Y		–
P 1376	Ignition coil cylinder 6 – early activation	Y		–
	Remove / Refit		59	

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AUXILIARY EMISSION CONTROLS

			Page no.	Diagnostic chart page no.
GROUP 14	**EXHAUST GAS RECIRCULATION- EGR**	**MIL**	**60**	
P **0400**	EGR flow or function sensor o/c	Y		**141**
P **1400**	EGR valve position control	Y		**142**
P **1401**	EGR valve position circuit	**Y**		**143**
P **1408**	EGR function sensor	Y		**144**
P **1409**	EGR valve circuit	Y		**145**
	Sensor and Valve Remove / Refit		**65**	
GROUP 15	**AUXILIARY AIR INJECTION - AIR**		**66**	
P **0411**	AIR insufficient flow	Y		**146**
P **0413**	AIR switching valve o/c	Y		**147**
P **0414**	AIR switching valve s/c	Y		**148**
	Air Pump Remove / Refit		**68**	
GROUP16	**CATALYST SYSTEM EFFICIENCY**		**69**	
P **0420**	Catalyst efficiency low - bank **1**	N		**149**
P **0430**	Catalyst efficiency low - bank **2**	N		**151**
GROUP 17	**EVAPORATIVE EMISSION CONTROL - EVAP**		**70**	
P **0441**	EVAP purge flow	Y		**153**
P **0442**	System leak detected	Y		
P **0443**	EVAP purge control valve circuit	Y		**154**
P **0446**	System vent control	Y		
P **0452**	System pressure sensor low input	Y		
P **0453**	System pressure sensor	Y		
P **1440**	EVAP purge valve open	Y		
P **1441**	ELC system **1** fault	Y		
P **1447**	ELC closure valve flow	Y		
P **1448**	ELC system **2** fault	Y		
P **1454**	System vacuum test	Y		
	Purge Valve Remove / Refit		**72**	

VEHICLE SPEED AND IDLE SPEED CONTROL

GROUP 18	**VEHICLE SPEED SENSOR - VSS**		**73**	
P **0500**	VSS	Y		**155**
GROUP 19	**IDLE SPEED CONTROL - ISC**		**74**	
P **0506**	Idle control rpm low	**Y**		**156**
P **0507**	Idle control RPM high	**Y**		**157**
P **1508**	ISC o/c	**Y**		**158**
P **1509**	ISC s/c	**Y**		**159**
	Remove / Refit		**77**	
GROUP 20	**PARK / NEUTRAL POSITION SWITCH - PNPS**		**78**	
P **1514**	High load neutral / drive	Y		**161**
P **1516**	Gear change neutral / drive	Y		**162**
P **1517**	Cranking neutral / drive	Y		**163**

5.1

COMPUTER AND OUTPUT CIRCUITS

			Page no.	Diagnostic chart page no.
GROUP 21	**ENGINE CONTROL MODULE – ECM**	**MIL**	80	
P 1607	MIL output circuit	Y		
P 1621	ECM engine immobilization i/p circuit malfunction	(not active)		
P 1622	ECM engine immobilization i/p code malfunction	(not active)		
GROUP 22	**CODES COMMON TO GROUPS 21 AND 23**		81	
P 0605	Internal control module ROM test error	Y		164
GROUP 23	**CODES COMMON TO ECM AND TCM**		82	
P 1775	Transmission MIL			**165**
P 1776	Ignition retard request duration	Y		**166**
P 1777	Ignition retard request circuit	Y		**167**
P 1794	System voltage	Y		**168**

5.1

TRANSMISSION

Note: All Transmission related 'P' Codes are explained in sections 8.1 and 8.2 of this manual.

PRELIMINARY INFORMATION

The information in this document is designed to assist non-franchised technicians in fault diagnosis and rectification on 1995MY Jaguar saloon vehicles compliant with OBDII legislation. The document comprises two main sections; Engine Management and Transmission numbered 5.1 and 8. Transmission, Section 8 is divided into two further sub-sections (8.1 and 8.2) to accommodate the different transmission systems fitted to normally aspirated and supercharged vehicles.

During fault diagnosis procedures reference is made to the Service Drive Cycle, instruction for performing this action are detailed below.

Introduction

Most of the frequent diagnostic tests involving sensors and actuators will run within approximately 20 seconds of starting the engine. The other less frequent diagnostics are timed such that they occur and complete within the Federal Test Pipe (FTP) drive cycle when conditions are appropriate to providing a correct outcome.

For the purposes of the service technician a more expedient method of generating a trip is described below. This should ensure that all diagnostic routines are exercised. Any fault information regarding any of the tests will be held in the GEMS system fault messages received parameters. It must be remembered that the GEMS system operates a two trip logic convention as allowed by CARB; ie two defined trips are required to switch on the MIL unless the faults compromise functionality of the whole system, causing the MIL to switch on immediately.

Service Drive Cycle

1. Allow the car to 'soak' at room temperature until the coolant temperature reaches **60°C.**
2. Start engine.
3. Idle for approximately 8 minutes; diagnostics such as a misfire, sensors and actuators will run and produce an outcome. An additional test requiring the engine to run for 15 minutes is present, thus a long idle period is the most appropriate method consuming time without excessive miles being clocked.
4. Accelerate in drive (maximum gear 3rd engine speed 2000 rpm, wide open throttle), up an incline to maintain a high load for approximately 10 seconds, this will test the Neutral Drive switch and Road Speed diagnostics.
5. Drive as normal, whilst driving, change through the gears briskly such that **40** gear changes are requested. This further tests the Neutral Drive Switch.

Note: Required gear changes must be between gears, not between Neutral and Drive.

6. Accelerate in drive to a target road speed in the range of 35-45mph, then cruise at target speed preferably in a flat surface to achieve a steady load. Attempt to maintain the speed for a duration of approximately 3 minutes. This allows adaptations and the Catalyst monitoring routine within the system to take place.
7. Come to idle and park.
8. Rev the engine to 1500/2000rpm for a duration of approximately one minute.
9. Wait at idle for a period of 2 minutes.
10. Interrogate Generic Scan Tool and establish faults, if any.
11. Switch off engine.

When performing diagnostics on a vehicle technicians should be aware that erreoneous codes may be introduced by their actions. In order to ensure correct diagnosis, all codes should be noted, before commencing diagnosis, so that induced codes can be identified on completion and safely cleared without futher work.

5.1 FUEL, EMISSION CONTROL AND ENGINE MANAGEMENT

5.1.1 Introduction

5.1.1.1 Diagnostic Codes

All emissions-related diagnostic codes relevant to the 1995MY Jaguar Sedan AJ16 engined vehicles are included in the Electrical Diagnostic Manual (EDM). The SAE diagnostic codes, which commence with a number **'0',** e.g. P 0234, are detailed in numerical order in the contents section. Voluntary codes, which have been added to the system and commence with a number '1', e.g. P 1234, are included in their related section.

Code numbers are displayed at the top outer corner of the relevant page, starting with P 0101, through to P 1796. The first page of each section displays all the codes for that section. A description of the location and operation of the component is followed by the individual codes and their fault definition.

5.1.1.2 On-Board Diagnostics II

OBD II covers any failure of the powertrain system likely to affect exhaust gas quality; this includes fuel, ignition, transmission, anti-lock braking, active suspension, tyre pressure monitoring and active differential failures. The emission effect threshold is an increase of 1.5 times the base vehicle standard.

The OBD II document contains clauses covering standard communication protocols, fault codes, vehicle terminology and vehicle interface points.. Whereas the original OBD only monitored failed items, OBD II provides failure prediction by observing performance deterioration over a period of time. The four main areas of observation are catalyst, misfire, exhaust gas recirculation and secondary air system.

5.1.1.3 Catalyst Monitoring

Precise control of the fuel and air mixture to the correct stoichiometric level is essential to the proper function of the three way catalyst, which oxidises Carbon Monoxide (CO) and Hydrocarbons (HC), while reducing Nitrous Oxide (NOx).

Deterioration of the catalyst conversion efficiency leads to a higher level of emissions. In order to be able to detect a change in the efficiency of the catalyst, the control system must observe both the incoming and the outgoing exhaust gases. To achieve this aim, exhaust gas oxygen sensors are fitted both upstream and downstream of the catalytic converter.

5.1.1.4 Misfire Monitoring

As engine misfire is the major cause of damaged catalytic converters, control systems must be able to monitor the quality of each individual firing and so detect engine misfire. The control system must recognise the following three types of engine misfire:

- A misfire which causes instantaneous catalyst damage.
- A misfire which will cause a vehicle to fail a Federal Emissions procedure.
- A misfire which will cause a vehicle to fail an Inspection and Maintenance test.

To create a reference for engine timing, the system needs to accurately detect engine position and speed. This is done by using a Crankshaft Position Sensor (CKPS).

5.1.1.5 Exhaust Gas Recirculation (EGR) Monitoring

The production of Nitrous Oxide is limited by the EGR system recirculating exhaust gas through the combustion chamber. The introduction of exhaust gas contaminates the fuel and air mixture and causes a slower / cooler fuel burn, reducing Nitrous Oxide emissions.

If the EGR system seizes closed it will cause the uncontrolled production of Nitrous Oxide; if it seizes open it will cause cooler and cooler combustion resulting in high Hydrocarbon and Carbon Monoxide emissions.

Control systems must detect a failure based upon a fixed Nitrous Oxide emission level. To achieve this control a temperature sensor is fitted in the EGR pipe and levels of emission can be assumed from changes in the temperatures recorded for given EGR valve openings.

5.1.1.6 Secondary Air Injection Monitoring

Secondary air, ie air from the secondary injection system is pumped into the exhaust pipe during the first 30 seconds of engine running, coinciding with burning , excess fuel, mixture expelled from the engine. This combination allows the excess fuel to burn, in the exhaust, shortening the raising time of the catalyst operating temperature.

Control systems must indicate when the air flow, from the secondary air injection system, decreases to the extent that an emissions failure level is reached. The system can gauge the air being delivered by recording the drift in oxygen sensor switching levels.

5.1.2 COMPONENT DESCRIPTION

Reference numbers eg (1) are shown in Fig. 1, on the following page.

The engine management system is controlled by the Engine Control Module (ECM) (1), which receives signals from the various EMS sensors, compares them to the required standards and then modifies the fuel and ignition settings to maintain an optimum, stoichiometric, fuel and air mixture under all conditions. Sensor information is supplied to the ECM as inputs (2), and control commands are issued through the ECM outputs (3).

The Mass Air Flow Sensor (MAFS) (4), measures the quantity of air drawn into the engine and reports to the ECM.

The Intake Air Temperature Sensor (IATS) (5), measures the temperature of the air in the induction tract and reports to the ECM.

The Idle Speed Control Valve (ISCV) (6), responding to ECM output signals and in conjunction with ignition timing control, governs engine idle speed.

The Engine Coolant Temperature Sensor (ECTS) (7), monitors the engine operating temperature and reports to the ECM.

The fuel pump (8), situated in the fuel tank, supplies fuel to the fuel rail (9); the fuel pressure regulator (10), in the fuel rail, controls the fuel pressure at the fuel injector (FI) (11), which injects fuel into the area behind the inlet valve, when commanded by the ECM.
The volume of fuel injected is governed by the length of time the injector is open; this time / quantity, required to achieve the correct mixture, is controlled by the ECM.

Ignition is by spark plugs with attached individual coils (12). Timing of ignition is varied according to speed and load.

5.1

The combustion gases, after passing through the exhaust manifold, enter the catalytic convertor (13), where the quality of the exhaust gas emission is modified. The quality of the exhaust gas emission is constantly checked by the Heated Oxygen Sensors (HO2S) (14), which are situated both upstream and downstream of the catalysts. By comparing the signal outputs of pre and post catalyst sensors the ECM can make corrections to the fuel and ignition settings as necessary. The sensors contain integral Heaters which accelerate the warming-up of the sensors to enable a rapid correction of initial settings which may be causing the emission of low quality exhaust gases.

Throttle position is detected by the Throttle Position Sensor (TPS) (15), which reports to the ECM.

The Exhaust Gas Recirculation (EGR) Valve (16), when activated by the ECM, allows exhaust gas to enter the intake air stream to dilute the oxygen content of the combustible fuel / air mixture, so lowering combustion temperatures and consequently Nitrous Oxide emissions. The temperature of the introduced gases is monitored by the adjacent EGR function sensor (17).

If combustion knock is detected by the Knock Sensor (KS) (18), ignition timing, which is normally at optimum advance, may be retarded on specific cylinders.

Engine speed is measured by the Crankshaft Position Sensor (CKPS) (19), which also monitors differences in crankshaft acceleration between cylinders, to detect specific cylinder low performance (misfire).
Engine position is measured by the Engine Position Sensor (CMP) (20). This measurement is used by the ECM to determine the commencement of injection.

The Secondary Air Injection (AIR) Pump (21), on command from the ECM, via a relay, provides additional air to reduce the level of Carbon Monoxide (CO) and Hydrocarbons (HC), in the exhaust gases. The additional air accelerates the rise in exhaust temperature to rapidly reach the catalyst operating temperature level. When the relay energises the pump in the AIR system it also energizes the solenoid controlling the integral stop valve, opening the air line, through the mechanical check valve (22), to the exhaust manifold.

The fuel tank (23), has a fuel capacity of 90% of the tank volume. The air volume above the fuel is vented to atmosphere through an activated charcoal canister (24), which absorbs the fuel vapour. As fuel is withdrawn from the tank, air is drawn in through the canister and as the fuel laden air in the tank expands, pressure is relieved through the canister which retains the suspended fuel.

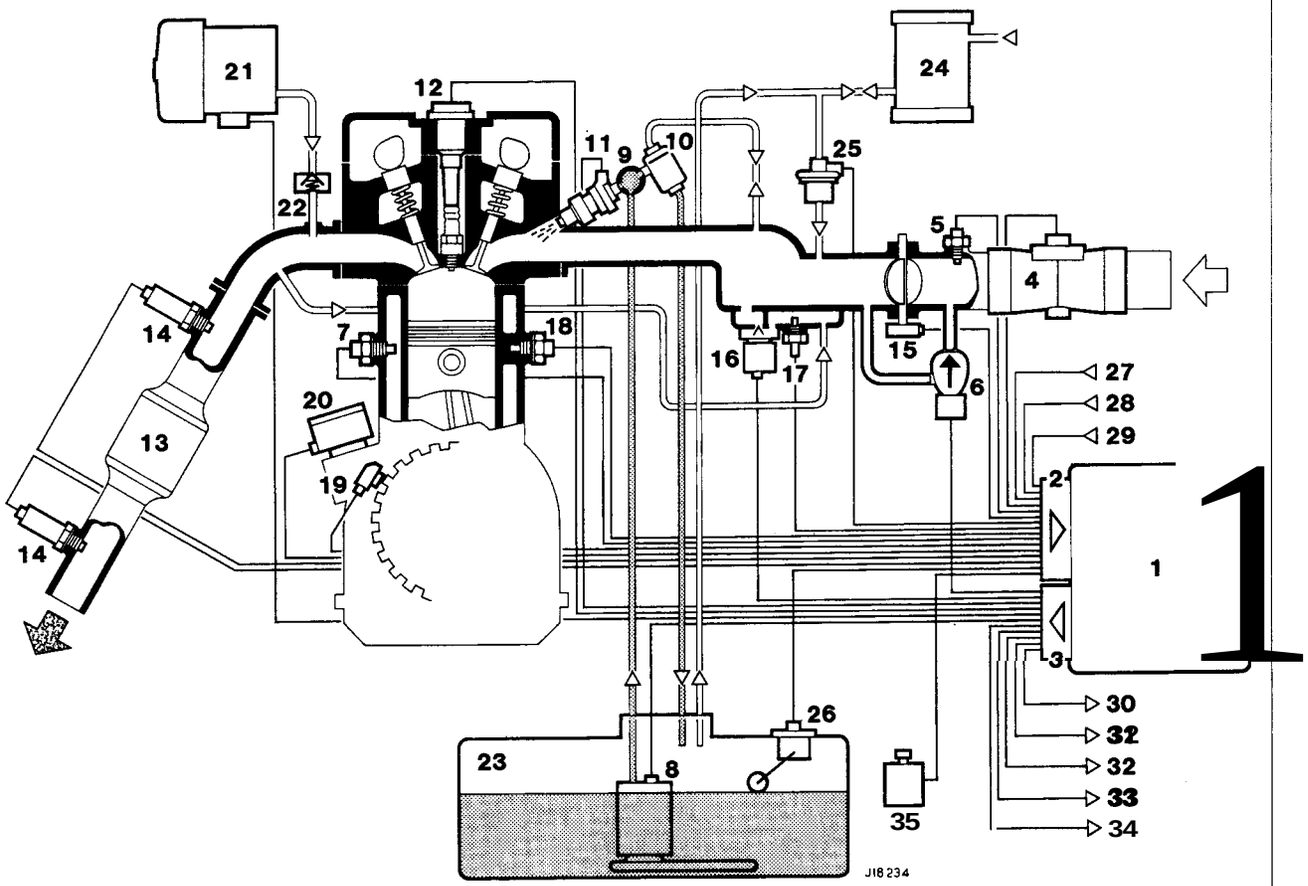
The canister purge valve (25), responds to an ECM signal and opens the canister line to inlet manifold vacuum; air then flows through the activated charcoal canister, carrying vapour into the inlet manifold.

Fuel level is measured by the fuel level sensor (26).

The park/ neutral switch (27), Security and Locking Control Module (SLCM) (28) and ignition on (29), signals are conveyed to the ECM input. Signals are conveyed to the instrument pack (road speed) (30), trip computer (31), diagnostic MIL lamp (32), Data Link Connector (DLC) (33), and Transmission Control Module (TCM) (Torque Control) (34), from the ECM.

The inertia switch (35), ensures that electrical power is cut off when the vehicle is subjected to a violent deceleration.

5.1

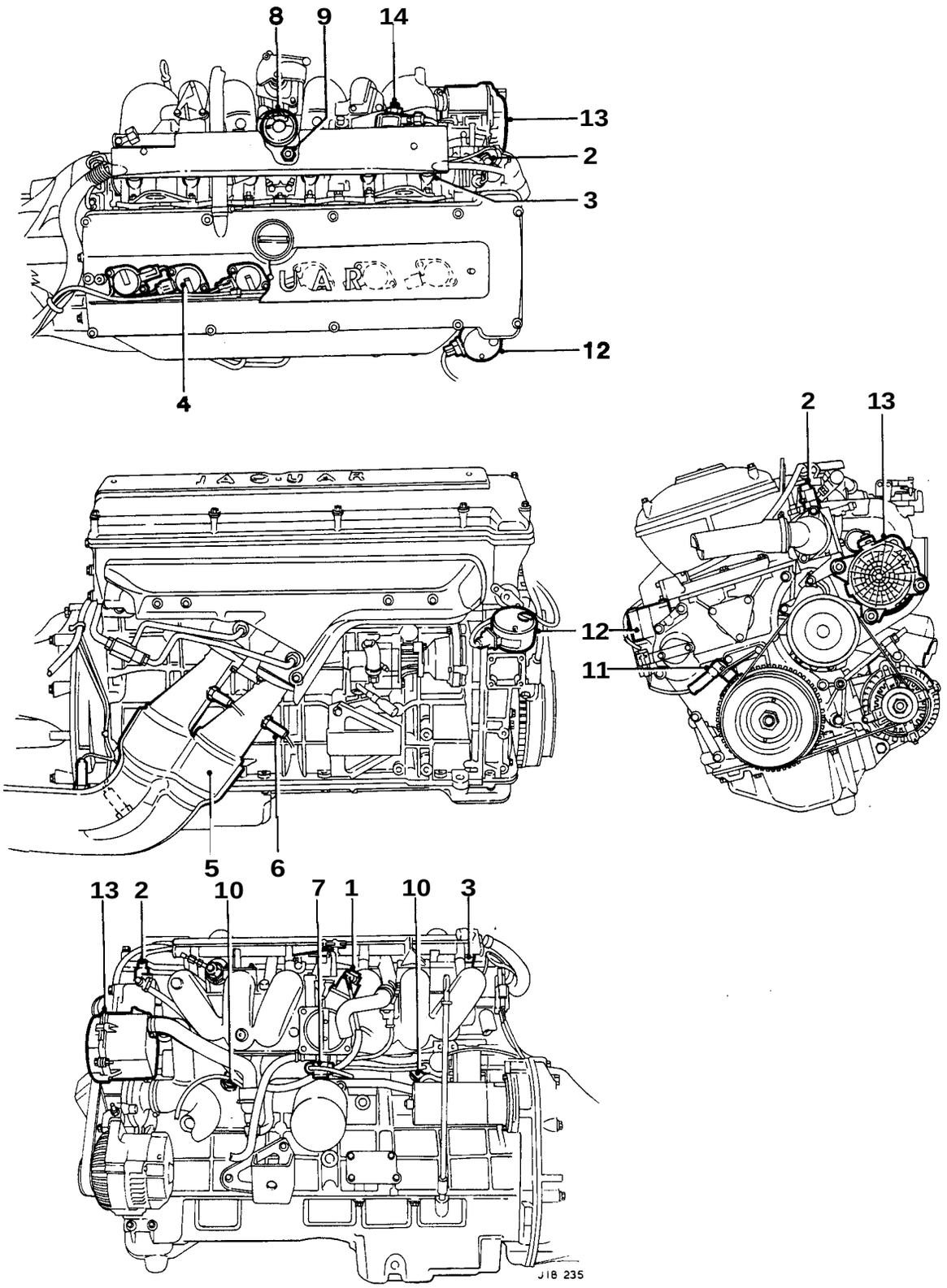


1. Engine Control Module (ECM)
2. Engine Control Module Inputs
3. Engine Control Module Outputs
4. Mass Air Flow Sensor (MAFS)
5. Intake Air Temperature Sensor (IATS)
6. Idle Speed Control Valve (ISCV)
7. Engine Coolant Temperature Sensor (ECTS)
8. Fuel Pump
9. Fuel Rail
10. Fuel Pressure Regulator
11. Fuel Injector (FI)
12. Spark Plugs with Integral Coils
13. Catalytic Convertor
14. Heated Oxygen Sensors and Heaters (HO2S)
15. Throttle Position Sensor (TPS)
16. Exhaust Gas Recirculation (EGR) Valve
17. EGR Function Sensor
18. Knock Sensor (KS)
19. Crankshaft Position Sensor (CKP)
20. Engine Position Sensor (CMP)
21. Secondary Air Injection System (AIR)
22. Mechanical Check Valve
23. Fuel Tank
24. Activated Charcoal Canister
25. Canister Purge Valve
26. Fuel Level Sensor
27. Park / Neutral Switch
28. Security and Locking Control Module
29. Ignition On
30. Instrument Pack (Road Speed)
31. Trip Computer
32. Diagnostic MIL Lamp
33. Data Link Connector (DLC)
34. Transmission Control Module (Torque Control)
35. Inertia Switch

Fig. 1 Engine Management System

5.1

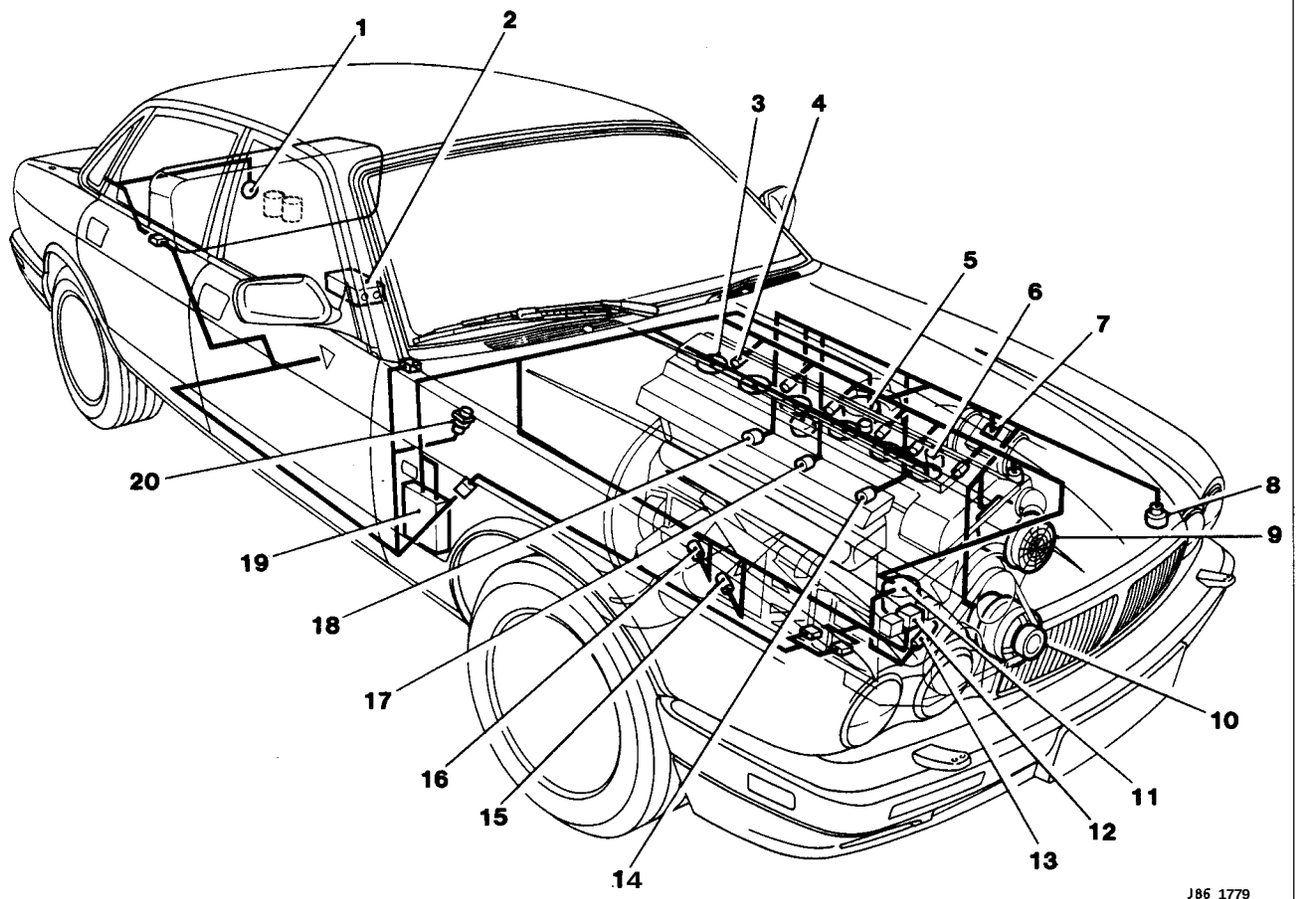
5.1.2.1 Component Location Diagrams



1. Idle Speed Control Valve (ISCV)
2. Engine Coolant Temperature Sensor (ECTS)
3. Fuel Injector (FI)
4. Spark Plugs with Integral Coils
5. Catalytic Convertor
6. Oxygen Sensors and Heaters (HO2S)
7. Throttle Position Sensor (TPS)
8. Exhaust Gas Recirculation Valve
9. EGR Function Sensor
10. Knock Sensor (KS)
11. Crankshaft Position Sensor (CKPS)
12. Engine Position Sensor (CMPS)
13. Secondary Air Injection System (AIR)
14. Fuel Pressure Regulator

Fig. 1

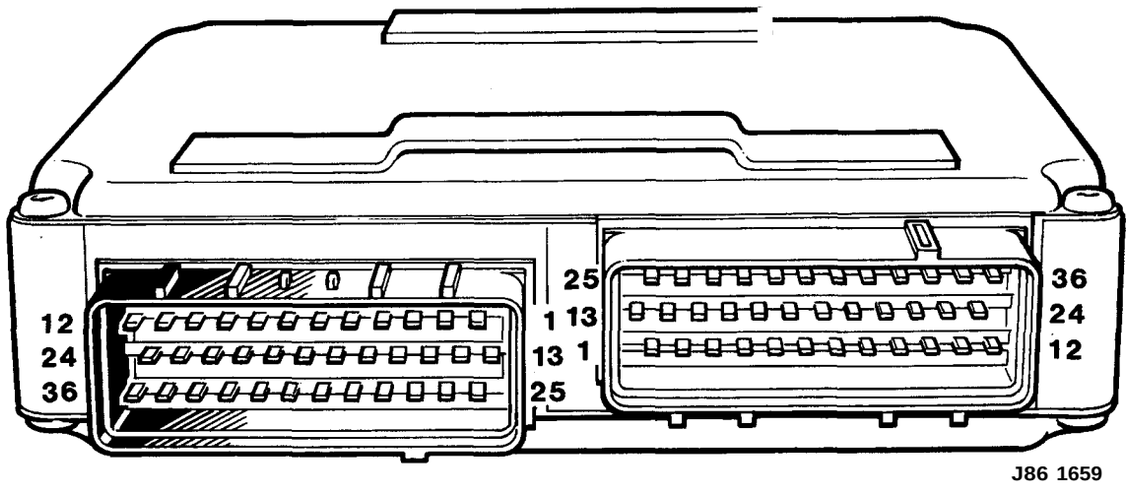
5.1



1. Fuel Level Sensor
2. Carbon Canister
3. On-plug Coils
4. Fuel Injectors
5. Exhaust Gas Recirculation Valve
6. Fuel Pump Regulator
7. Mass Air Flow Sensor
8. Purge Valve
9. Air Pump
10. Generator
11. Engine Position Sensor
12. EMS Relay
13. Crankshaft Position Sensor
14. Knock Sensor
15. Heated Oxygen Sensor
16. Heated Oxygen Sensor
17. Throttle Position Sensor
18. Knock Sensor
19. Engine Control Module
20. Inertia Switch

Fig. 1 Engine Management Schematic

5.1.2.2 *Engine Management Control Module – Pin Details*



High Power Connector A, P1104 (Black)

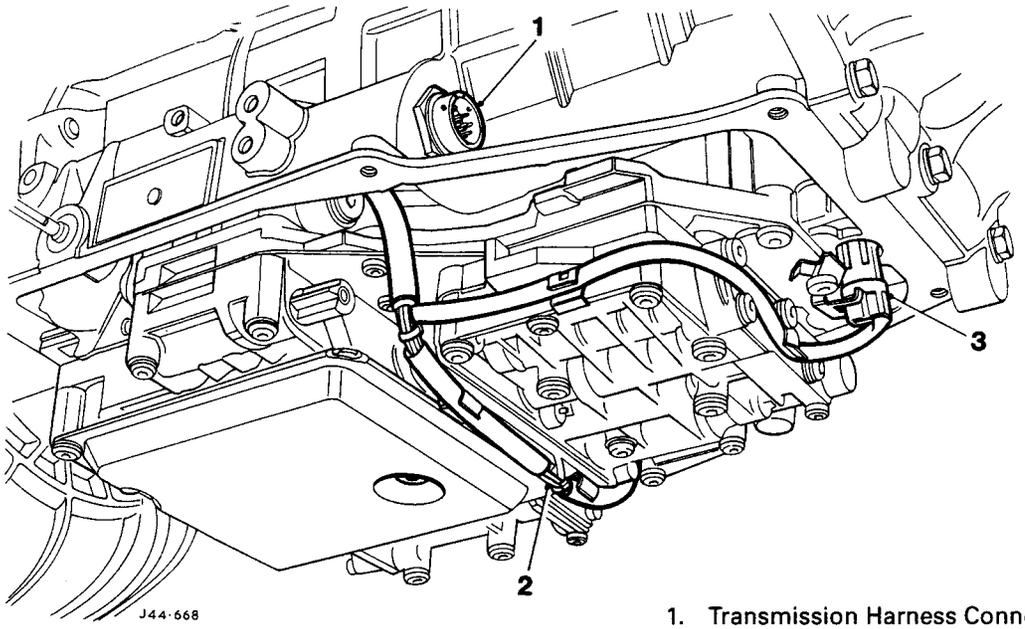
1. Power Ground
2. Injector 1
3. Idle Speed Control 1
4. HO2S (Post Cat) Heater O/P
5. Ignition Coil 4
6. Ignition Coil 3
7. Air Pump O/P
8. Ignition Coil 2
9. Ignition Coil 5
10. Ignition Coil 1
11. Ignition Coil 6
12. Power Ground
13. Injector 4
14. Injector 3
15. Injector 2
16. Idle Speed Control 4
17. Fuel Used O/P
18. ECM Control Relay O/P
19. Fuel Pump Relay O/P
20. MIL
21. Air Conditioning Relay O/P
22. Engine Speed O/P
23. Crankshaft Position Sensor I/P
24. ECM Control Relay Supply
25. Injector 6
26. Crankshaft Position Sensor Ground
27. Injector 5
28. Idle Speed Control 3
29. Idle Speed Control 2
30. HO2S (Pre Cat) Heater O/P
31. Evap. Vent Close Valve O/P
32. Throttle Position O/P
33. Engine Torque O/P
34. Evap. Valve O/P
35. EGR Valve O/P
36. Power Ground

Low Power Connector B, P1105 (Red)

1. Intake Air Temperature I/P
2. Electrical Load I/P
3. EGR Valve Function Sensor I/P
4. Mass Air Flow I/P
5. –
6. HO2S 3 I/P
7. Throttle Position Sensor 5V Ground
8. HO2S Signal Ground
9. Knock Sensor Ground
10. Diagnostic K Line
11. Throttle Position Sensor 5V Supply
12. Throttle Position Wiper
13. –
14. Engine Coolant Temperature I/P
15. EGR Valve Position I/P
16. HO2S 1 I/P
17. BVC I/P
18. HO2S 2 I/P
19. HO2S 4 I/P
20. Fuel Tank Level Sensor I/P
21. Knock Sensor A I/P
22. –
23. –
24. Engine Position Sensor 12V Supply
25. –
26. Torque Reduction Request
27. Park/Neutral Position I/P
28. Road Speed I/P
29. Mass Air Flow Sensor Ground
30. Small Signal Ground
31. Small Signal Ground
32. Knock Sensor B I/P
33. Ignition 'On' I/P
34. Engine Position Sensor I/P
35. Start Inhibit I/P
36. Air Conditioning 'On' I/P

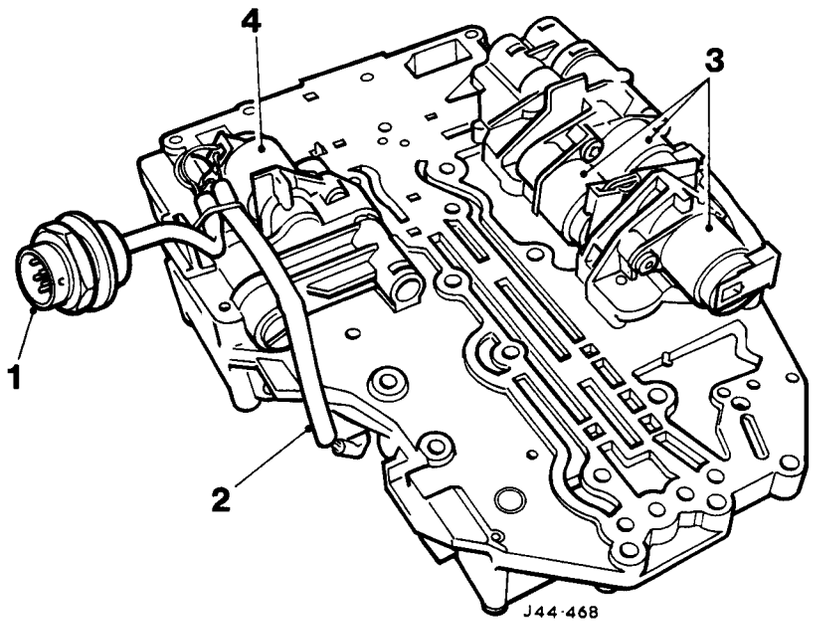
Fig. 1

5.1.2.3 Transmission Component Location Diagrams



1. Transmission Harness Connector
2. Temperature Sensor
3. Speed Sensor

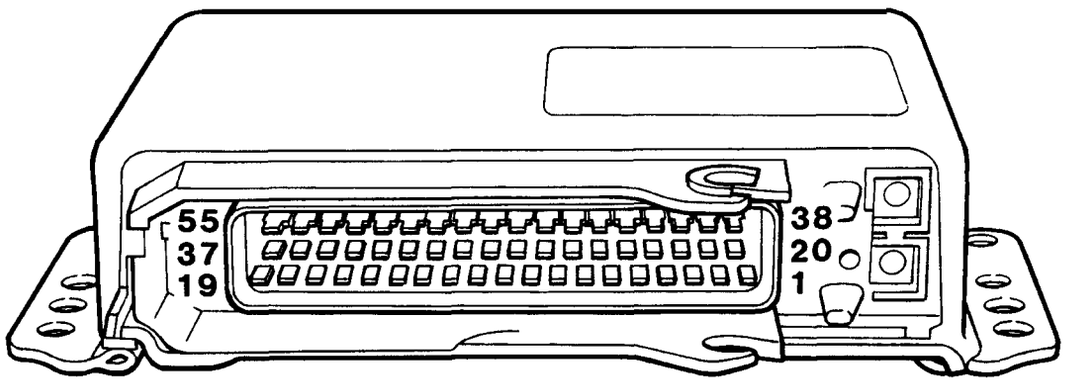
Fig. 1 ZF 4HP 24 E Automatic Transmission



1. Transmission Harness Connector
2. Internal Harness
3. Solenoid Operated Valves
4. Pressure Control valve

Fig. 2 ZF 4HP 24 E Automatic Transmission

5.1.2.4 Transmission Control Module (ZF 4HP 24 E) – Pin Details



Pin	Function
1	Ignition Supply
2	Vehicle Speed Sensor Positive
3	Engine Speed
4	Program Switch Input
5	Solenoid Valve No.1
6	Pressure Regulator
7	Digital Ground
8	n/a
9	n/a
10	n/a
11	n/a
12	n/a
13	n/a
14	Position Code Y
15	Diagnostic L Line
16	System Fault Indicator
17	n/a
18	n/a
19	Solenoid Valves Supply
20	Road Speed Screen
21	Engine Torque Signal
22	n/a
23	n/a
24	Solenoid Valve M/2
25	n/a
26	Power Ground
27	n/a
28	n/a

Pin	Function
29	Traction Control Input
30	n/a
31	n/a
32	Torque Reduction Request
33	Position code Z
34	n/a
35	n/a
36	n/a
37	n/a
38	Road Speed Negative
39	n/a
40	n/a
41	Kick Down Switch
42	Solenoid Valve No.3
43	n/a
44	Oil Temperature Sensor Ground
45	n/a
46	Oil Temperature Sensor Input
47	Throttle Position Input
48	n/a
49	Sport Mode Indicator
50	Position Code X
51	Diagnostic K Line
52	n/a
53	n/a
54	n/a
55	n/a

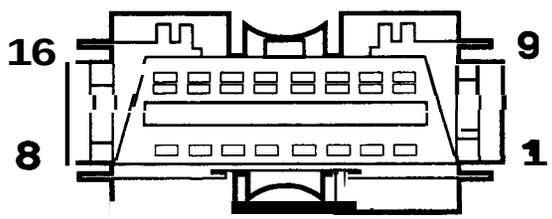
Fig. 1

5.1.3 DIAGNOSTICS

5.1.3.1 Data Link Connector (DLC)

The DLC is located in the passenger compartment between the steering column and the centre line of the vehicle, mounted at the forward end of the transmission tunnel.

The DLC is rectangular in design and capable of accommodating up to sixteen terminals. The connector has keying features to allow easy connection in a one handed / blind operation. The vehicle connector and the test equipment connector have latching features that ensure the test equipment connector will remain mated when properly connected.



J86 1922

Data Link Connector Pin Details

Cavity	General Assignment	Cavity	General Assignment
1	Ignition Switch Override	9	Battery Power – Switched
2*	(not used)	10*	(not used)
3	Discretionary (not used)	11	Discretionary (not used)
4"	Chassis Ground	12	Discretionary (not used)
5*	Signal Ground (SIG RTN)	13	Discretionary (not used)
6	Discretionary (not used)	14	Discretionary (not used)
7"	K Line of ISO 9141	15*	L Line of ISO 9141
8	Discretionary (not used)	16*	Battery Power – Unswitched

* Federal Mandated Pins

Fig. 1 Data Link Connector

5.1.4 DATA STREAM INFORMATION

5.1.4.1 Parameter Identification (PID) – Access (Mode 01)

Generic OBD II PID List

PID (Hex)	Freeze Frame		Acronym	Description	Units of Measurement
	ECM	TCM			
0000	X	X	Support	Supported PIDS	Unitless
0001	X	X	CCNT	Cont. Code Counter	Unitless
0003	X		FUEL–B1	Fuel System Status Bank 1	Open / Closed
					OP DRV
					OP SYS / CL O2S
0003	X		FUEL–B2	Fuel System Status Bank 2	Open / Closed
					OP DRV
					OP SYS / CL O2S
0004	X	X	LOAD	Calculated Engine Load	Percent
0005	X		ECT	Engine Coolant Temp	Degrees
0006	X		SFT1	Short Term Fuel Trim	Percent
				Bank 1	
0007	X		LFT1	Long Term Fuel Trim 1	Percent
0008	X		SFT2	Short Term Fuel Trim	Percent
				Bank 2	
0009	X		LFT2	Long Term Fuel Trim 2	Percent
000C	X	X	RPM	Revolutions Per Minute	RPM
000D	X	X	VSS	Vehicle Speed Sensor	MPH – KPH
000E	X		SPARK	Spark Advance Cyl. 1	Degrees (Angle)
000F	X		IAT	Intake Air Temp	Degrees
0010	X		MAF	Mass Air Flow Rate	GM/SEC
0011	X	X	TP	Throttle Position	Percent
0012	X		AIR	Secondary Air	On / Off
0013	X		O2S	Oxygen Sensor Location	Unitless
0014	X		O2S11	Oxygen Sensor 11	Volts
0014	X		SFT11	Short Term Fuel Trim	Percent
				02s 11	
0015	X		O2S12	Oxygen Sensor 12	Volts
0015	X		SFT12	Short Term Fuel Trim	Percent
				02s 12	
0018	X		O2S21	Oxygen Sensor 21	Volts
0018	X		SFT21	Short Term Fuel Trim	Percent
				02s 21	
0019	X		O2S22	Oxygen Sensor 22	Volts
0019	X		SFT22	Short Term Fuel Trim	Percent
				O2S 22	

X = Freeze Frame PID (refer to Freeze Frame Access for more information)

Open = Open loop, have not satisfied conditions for closed loop.

Closed = Closed loop using O2S(s) as feedback for fuel control.

OP DRV = Open loop due to due to driving conditions (heavy acceleration)

OP **SYS** = Open loop due top vehicle system fault.

CL O2S = Closed loop fuel control, but fault with O2S sensor(s).

5.1

5.1.4.2 Freeze Frame Data – Access (Mode 2)

Freeze Frame Data allows access to emission related data values from specific generic PIDs. These values are stored the instant an emission related DTC is stored in Continuous Memory. This provides a snapshot of the conditions that were present when the DTC was stored. Once one set of freeze frame data is stored, this data will remain in memory even if another emission related DTC is stored, with the exception of Misfire or Fuel System DTCs. Once Freeze frame data for Misfire or Fuel System DTC is stored, it will overwrite any previous data and freeze frame will not be further overwritten. When a DTC associated with the freeze frame is erased or a PCM memory reset is performed, new freeze frame data can be stored again. In the event of multiple emission related DTCs in memory, always note the DTC for the freeze frame data.

Freeze Frame Data Access List

PID	Freeze Frame		Acronym	Description	Units of
(Hex)	ECM	TCM			Measurement
0000	X	X	SUPPORT	Supported Pids	Unitless
0002	X	X	FCFF	Fault Causing Freeze Frame	Unitless
0003	X		FUELB1	Open/Closed Loop 1	As mode 1
0003	X		FUELB2	Open/Closed Loop 2	AS Mode 1
0004	X	X	LOAD	Calculated Load Value	Percent
0005	X		ECT	Engine Coolant	DEGREES
0006	X		SFT1	Short Term Fuel Bank 1	Percent
0007	X		LFT1	Long Term Fuel Bank 1	Percent
0008	X		SFT2	Short Term Fuel Bank 2	Percent
0009	X		LFT2	Long Term Fuel Bank 2	Percent
000C	X	X	RPM	Engine RPM	R/MIN
000D	X	X	VSS	Vehicle Speed	MPH/KPH

5.1.4.3 Generic Scan Tool

Refer to the scan tool manufacturer's instructions to access Freeze Frame Data (Mode 02).

5.1.4.4 Oxygen Sensor Monitoring Test Results – Access (Mode 05)

The Oxygen Sensor Monitoring Test Results allows access to the On–Board sensor fault limits and actual values during the test cycle. The test cycle has specific operation conditions that must be met (engine temperature, load, etc.) for completion. This information helps to determine the efficiency of the exhaust catalyst. Listed below are the tests and test identification numbers that are available.

Test ID	Test Description	Units
01h	Rich to lean sensor threshold voltage for test cycle	volts
02h	Lean to rich sensor threshold voltage for test cycle	volts
03h	Low sensor voltage for switch time calculation	volts
04h	High sensor voltage for switch time calculation	volts
05h	Rich to lean sensor switch time	seconds

The following codes to be confirmed:

06h	Lean to rich sensor switch time	seconds
09h	Time between sensor transitions	seconds
35h	Rich to lean sensor switch time	seconds
36h	Lean to rich sensor switch time	seconds
80h	Switching time mark–space ratio	seconds

MASS AIR FLOW SENSOR – MAFS

Group 1

P 0101
P 0102
P 0103

Monitoring Procedure

The range is checked for values outside the limits.

No signal (open circuit) at any time with the ignition on, or a high signal output below a set engine speed, will be registered as a fault. A low signal test will check for an air meter output consistent with other engine parameters. If these tests are not passed then a fault event is recorded and if the count exceeds a given limit then a fault is registered.

While fault counting is in progress a back-up value of airflow will be supplied and when faults are present a default value of airflow, calculated from throttle position, engine speed and inlet air temperature, will be supplied. The strategy will report to the Diagnostic Status Manager (DSM) when all the tests have been performed once; the DSM will then decide whether to store a fault code and illuminate the MIL lamp.

The MAFS (1 Fig. 1) is situated on the left side of the engine compartment, connected to the induction air filter and the induction manifold elbow (2 Fig. 1). The MAFS electrical connection to the vehicle harness is by the three pin connector (3 Fig. 1).

5.1

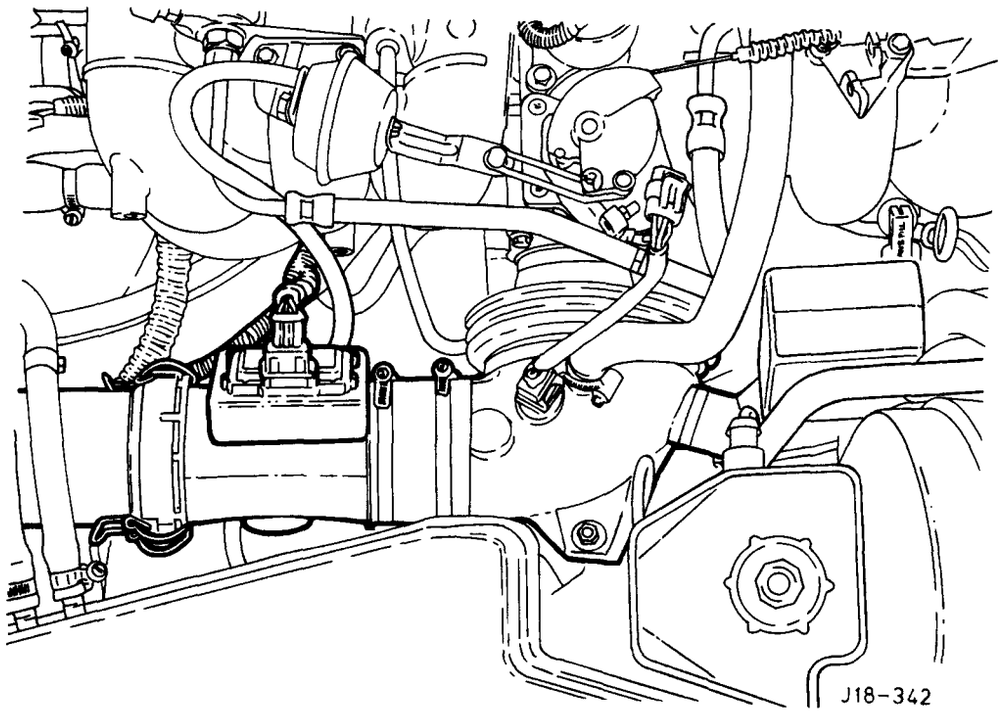


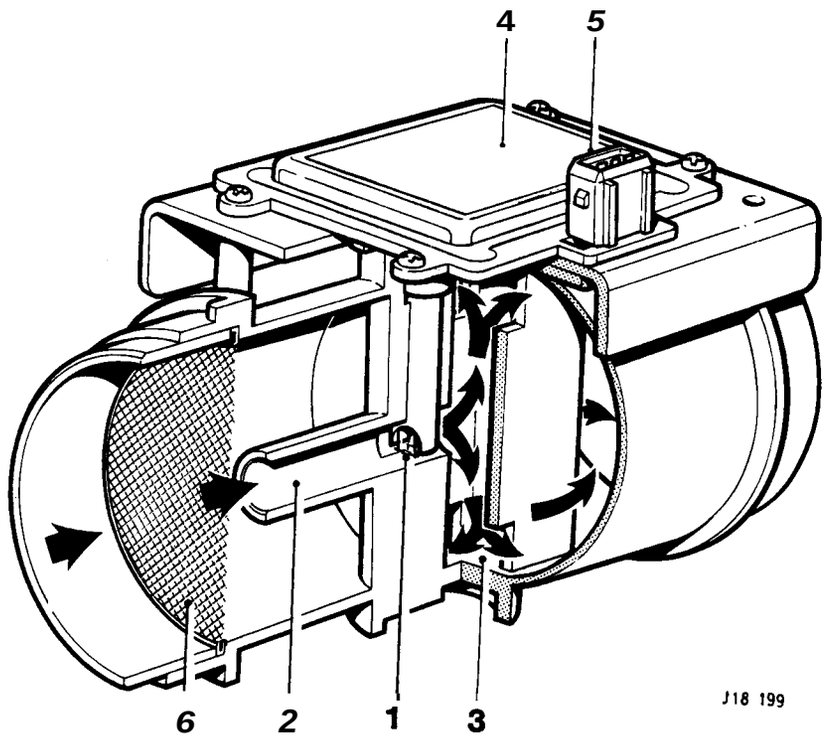
Fig. 1 MAFS Location

5.1

Structure of MAFS

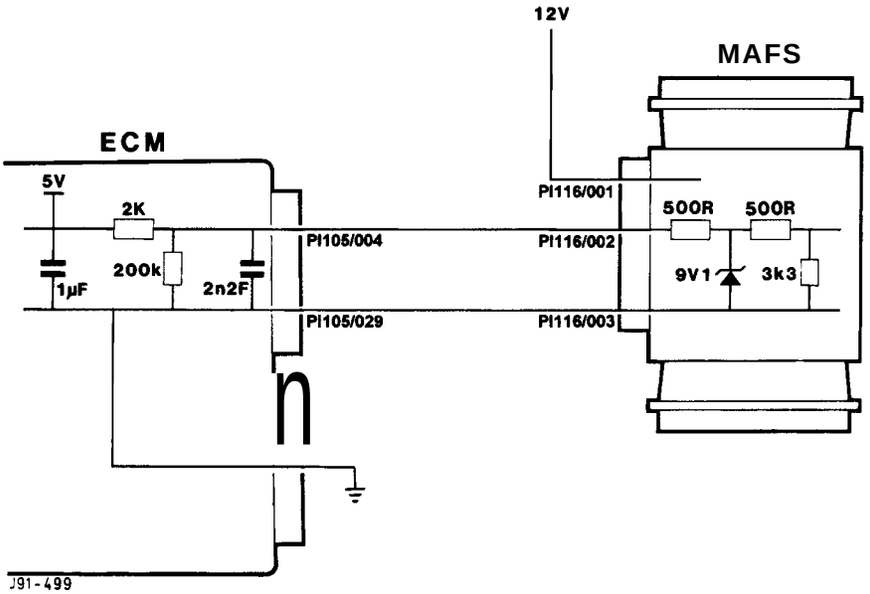
The Lucas 20AM MAFS is of the heated wire type, which measures air flow by the cooling effect of passing air over a heated platinum wire, altering the electrical resistance of that wire. The electrical resistance value is converted to an analogue output voltage signal, which is supplied to the Engine Control Module (ECM), for the regulation of the correct air / fuel ratio.

The heated wire sensor (1 Fig. 1) is situated in the central pillar, which is an integral part of the casing. The pillar has a central tube entry (2 Fig. 1) and four exit slots (3 Fig. 1) which allow air to pass over the heated wire sensor and return to the main air flow. The sensor is an integral part of the heatsink and control unit (4 Fig 1) which has the three pin connector (5 Fig. 1) included in the moulding. The metal gauze screen (6 Fig. 1) is designed to stabilize the airflow through the sensor and also serves to protect the sensor from any debris which may enter the air–stream.



Fin. 1 MAFS Sectional Diagram

MAFS / ECM Interface Circuit



MAFS pin no.	Voltage	Description
001	12v	Ignition dependent voltage supply
002	0–5 V	Signal – low current
003	0V	Ground via ECM

Fig. 1 Interface between ECM and MAFS

5.1

Additional Information

Nominal Output Voltage (V)	Flow (kg/s)
0.823	0.002
0.977	0.003
1.100	0,004
1.485	0.009
1.897	0.017
2.293	0.030
2.689	0.050
3.108	0.080
3.525	0.120
3.874	0.160
4.279	0.215
4.700	0.284

MASS AIR FLOW SENSOR (MAFS) (AJ16 NORMALLY ASPIRATED) - RENEW

SRO 18.30.15

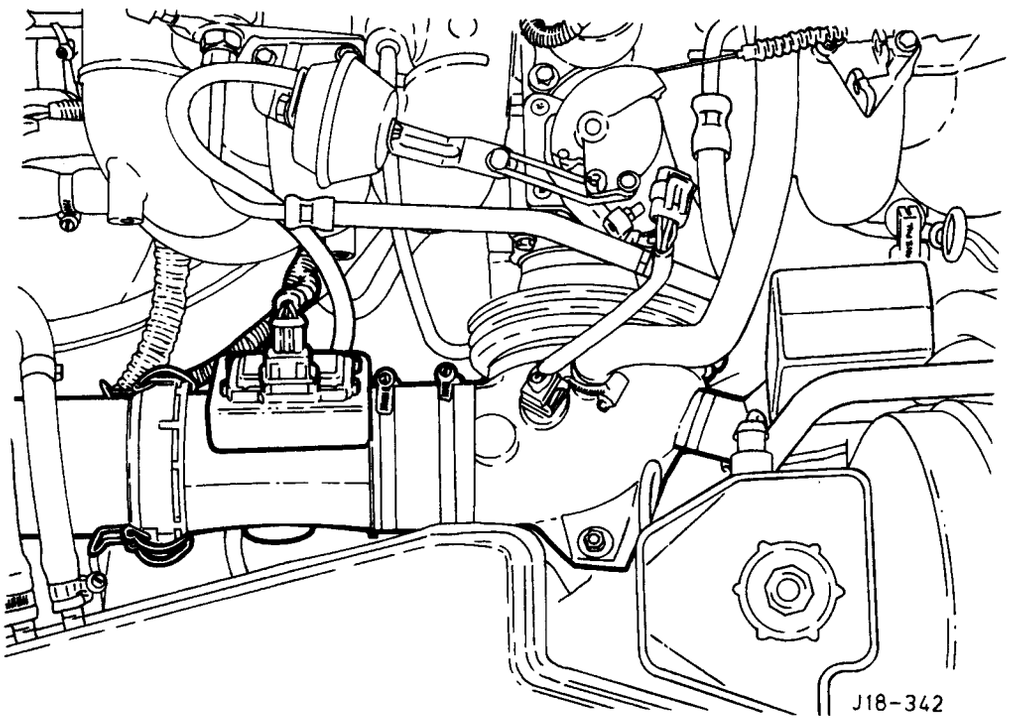


Fig. 1 MAFS Location

The Mass Air Flow Sensor (MAFS) is situated on the left-hand side of the engine compartment, connected to the induction air filter and the induction manifold elbow.

- Open the hood and fit a wing cover.
- Open the trunk and remove the battery cover.
- Disconnect the battery ground lead.
- Disconnect the MAFS harness multi-plug (3 Fig. 1).
- Undo and remove the securing nut of the induction manifold elbow mounting.
- Undo and remove the securing nut of the induction air filter mounting.
- Slacken the securing clips of the induction manifold elbow hose at the MAFS. Displace and reposition the hose.
- Displace and reposition the induction manifold elbow from the mounting bobbin.
- Displace and reposition the induction air filter from the mounting bobbin.
- Carefully displace and remove the MAFS.
- Remove and discard the 'O' ring seal.

Fitting a new MAFS is the reverse of the removal procedure. Make sure the 'O' ring seal is correctly seated and located in the locating dowel **of** the induction air filter.

INTAKE AIR TEMPERATURE - IAT

Group 2

P 0112
P 0113

Monitoring Procedure

The range is checked for values outside the limits.

If these tests are not passed then a fault event is recorded and if the count exceeds a given limit then a fault is registered. While fault counting is in progress a back-up value of air temperature will be supplied and when faults are present a default value of air temperature will be supplied. The strategy will report to the Diagnostic Status Manager (DSM) when all the tests have been performed once; the DSM will then decide whether to store a fault code and illuminate the MIL.

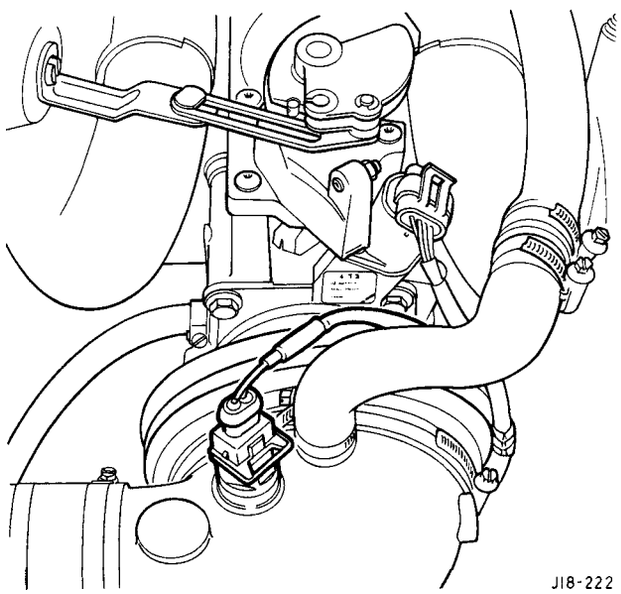
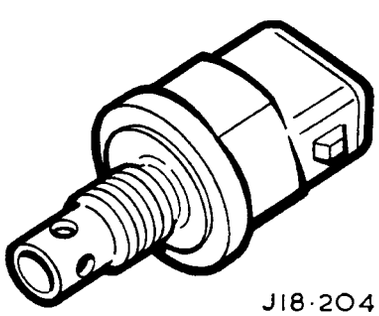


Fig. 1 IAT Sensor Location

5.1

The Lucas 10TTIAT Sensor ((Fig. 2) consists of a negative temperature coefficient thermistor exposed to inlet air and enclosed in a ventilated protected housing.



Fia. 2

The following values may be used to check the function of the thermistor:

2.90V at 20°C to 0.57V at 95°C

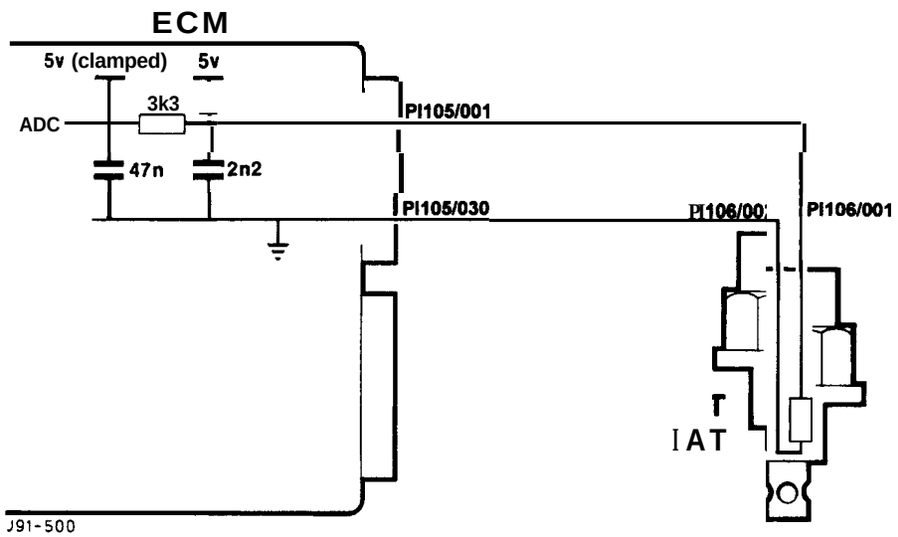


Fig. 1 Interface between ECM and IAT

5.1

IAT Circuit Low Input *P 0112*

The IAT output is checked for intake values outside expected limits:

- High temperature threshold **180°C**
- Low temperature threshold 39°C

Possible causes:

- Temperatures have been very cold (sub –50°C)
- IAT disconnected
- IAT harness open circuit or high resistance
- IAT signal short circuit to battery voltage
- IAT sensor fault – open circuit or high resistance
- ECM interface circuit fault

IAT Circuit High Input *P 0113*

A range check on the output of the air temperature sensor is performed to check for intake values outside expected limits.

Possible causes:

- Temperatures have been very hot – engine has boiled
- IAT harness wires short circuit to ground
- IAT fault – low resistance
- ECM interface circuit fault

INTAKE AIR TEMPERATURE SENSOR – RENEW

SRO 18.30.52

The AIT sensor is mounted in the induction elbow.

- Open the hood and fit a wing cover.
- Open the trunk and remove the battery cover.
- Disconnect the battery ground lead.
- Disconnect the multi–plug from the AIT sensor.
- Undo and remove the AIT sensor and copper washer from the induction elbow.
- Refitting a new AIT sensor is the reverse of the removal procedure.

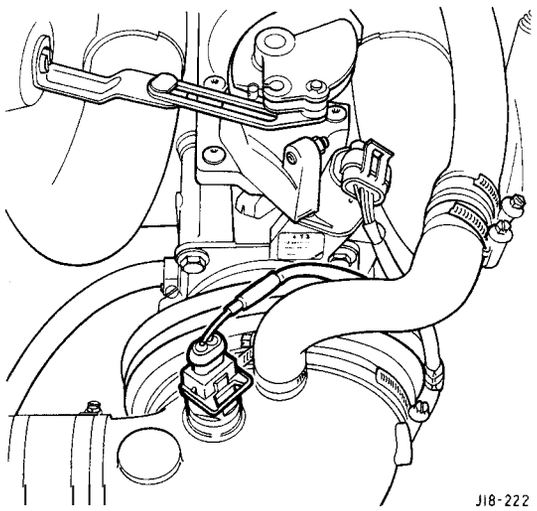


Fig. 1 IAT Sensor

ENGINE COOLANT TEMPERATURE - ECT

Group 3

P 0116
PO717
P 0118
P 0125

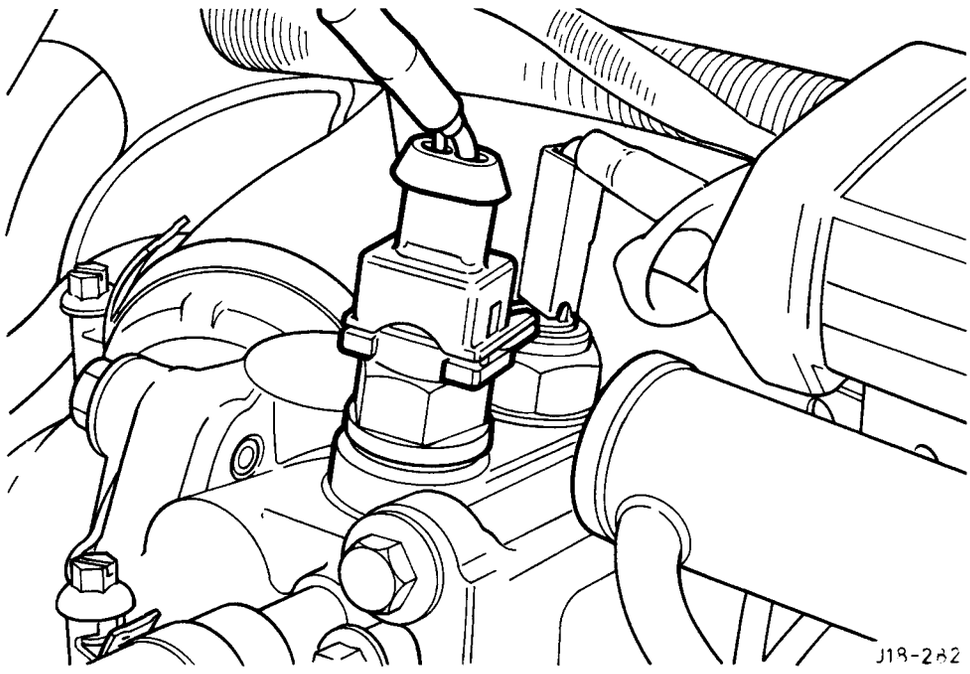
Monitoring Procedure

The range is checked for values outside the limits.

A 'time-to-warm-up' test will check that the sensor is responding to the rise in coolant temperature in the running engine and ensure that closed loop fuelling is entered within a specified time limit. Another test will check for abnormal falls in temperature once the temperature rise has been detected.
If these tests are not passed then a fault event is recorded and if the count exceeds a given limit then a fault is registered.

While fault counting is in progress a back-up value of coolant temperature will be supplied and when faults are present a default value of coolant temperature will be supplied. Coolant temperature default value will depend on intake air temperature value. The strategy will report to the Diagnostic Status Manager when all the tests have been performed once; the DSM will then decide whether to store a fault code and illuminate the MIL Lamp.

5.1



Fin. 1 Location of ECT sensor

The Lucas 8TT Engine Coolant Temperature Sensor (ECTS) is a negative temperature coefficient thermistor enclosed in a protective housing. The ECTS is situated in the thermostat housing and supplies the ECM with engine coolant temperature information.

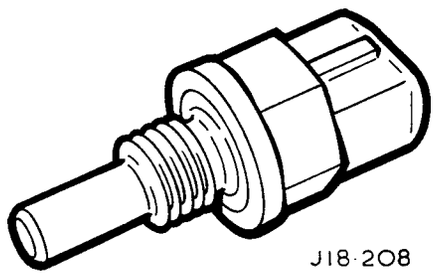


Fig. 1 ECTS

5.1

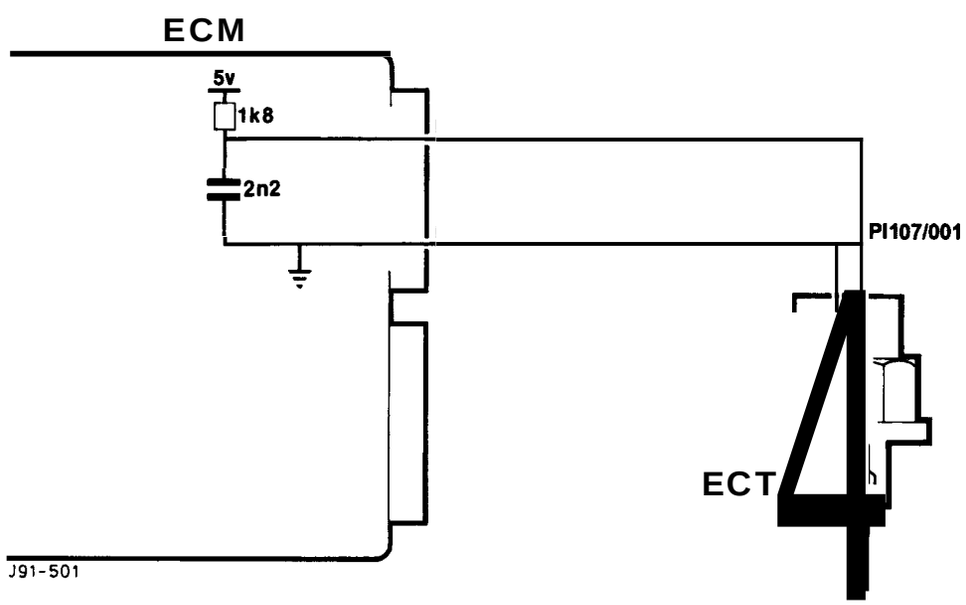


Fig. 2 Interface between ECM and ECTS

ECT Circuit Range / Performance – Falling Temperature *P 0116*

A falling temperature test will check for abnormal falls in temperature once a temperature rise has been detected.

Possible causes:

- Thermostat seized open
- ECT connector high resistance when hot
- Intermittent high resistance – ECT harness
- ECT – changing output

ECT Circuit Low Input *P 0117*

The output of the ECT sensor is checked for values outside limits:

- High temperature limit 180°C
- Low temperature limit –39°C

Possible causes:

- Temperatures under –50°C
- ECT disconnected
- ECT harness open circuit or high resistance
- ECT signal short circuit to battery voltage
- ECT fault – open circuit or high resistance
- ECM interface circuit fault

5.1

ECT Circuit High Input *P 0118*

The output of the ECT sensor is checked for values outside limits.

Possible causes:

- Temperatures very hot – engine boiled
- ECT harness wires short circuit to ground
- ECT fault – low resistance
- ECM interface circuit fault

Excessive Time to Enter Closed Loop Fuel Control *P 0125*

A test will check that the sensor responds in 5 seconds to a rise in coolant temperature to 20°C

Possible causes:

- Low ambient temperature
- Thermostat seized open
- ECT harness – high resistance
- ECT high resistance
- ECM interface circuit

Additional Information

The following information is also relevant to the IAT sensor. Figure 1 shows a graph of coolant temperature sensor resistance with respect to temperature.

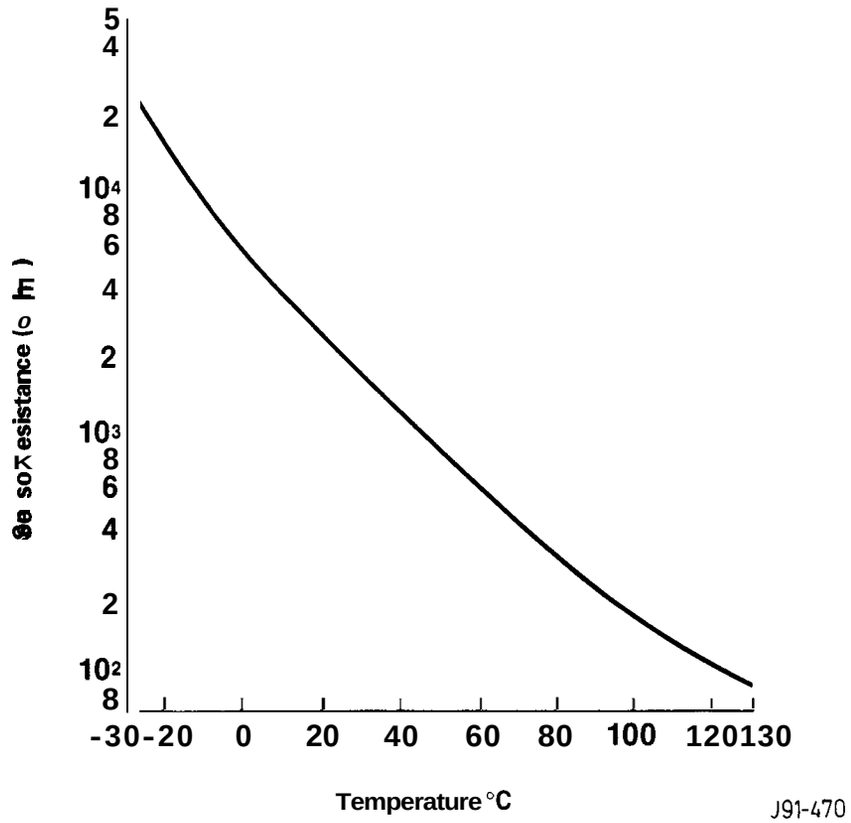
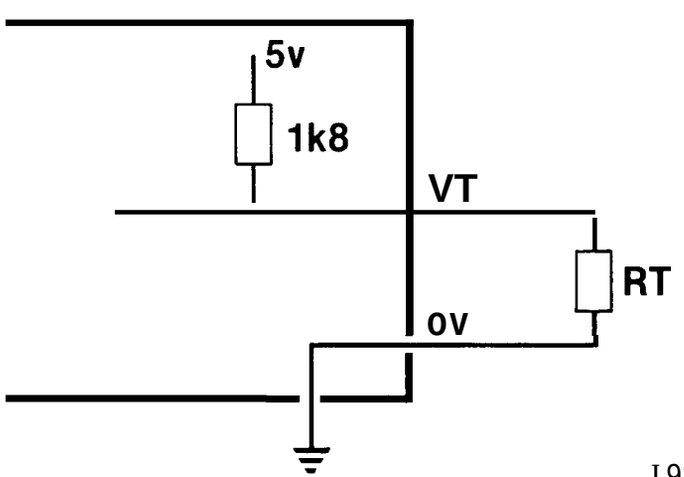


Fig. 1 Sensor resistance with respect to temperature

The voltage level for any temperature may be calculated by taking the following readings and substituting them into the formula. Figure **2** shows the test points.



Formula: $VT = \frac{RT}{(1k8 + RT)} \times 5v$

Fig. 2 Test points

COOLANT TEMPERATURE SENSOR – RENEW

SRO 18.30.10

The coolant temperature sensor is mounted in the thermostat housing.

WARNING: ALLOW THE ENGINE TO COOL BEFORE WORKING ON THE COOLING SYSTEM.

- Open the hood and fit a wing cover.
- Open the trunk and remove the battery cover.
- Disconnect the battery ground lead.
- Carefully release the coolant pressure at the header tank. Re-tighten the header tank cap.
- Disconnect the coolant temperature sensor multi-plug.
- Undo and remove the coolant temperature sensor from the thermostat housing.

Refitting a new coolant temperature sensor is the reverse of the removal procedure.

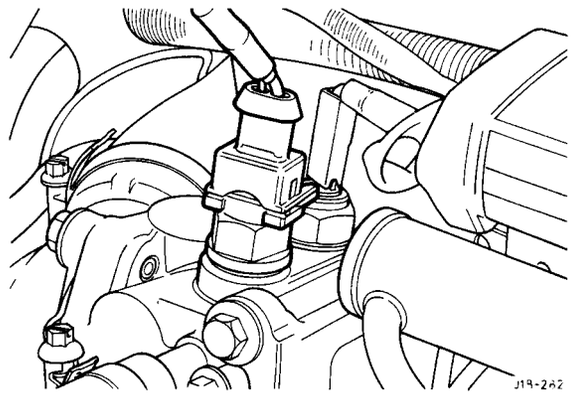


Fig. **1** Coolant Temperature Sensor

THROTTLE POSITION – TP

Group 4

P 0121
P 0122
P 0123

Monitoring Procedure

The range is checked for values outside the limits.

When faults are present a default value of throttle position will be supplied which will be one of two values using estimated manifold pressure. High manifold pressure will cause the default to be a high value of throttle position which will indicate full load, otherwise the default will be a mid–range value of throttle position. While fault counting is in progress a back–up value of throttle position will be supplied which will be the last valid value.

The strategy will report to the Diagnostic Status Manager (DSM) when all the tests have been performed once; the DSM will then decide whether to store a fault code and illuminate the MIL Lamp.

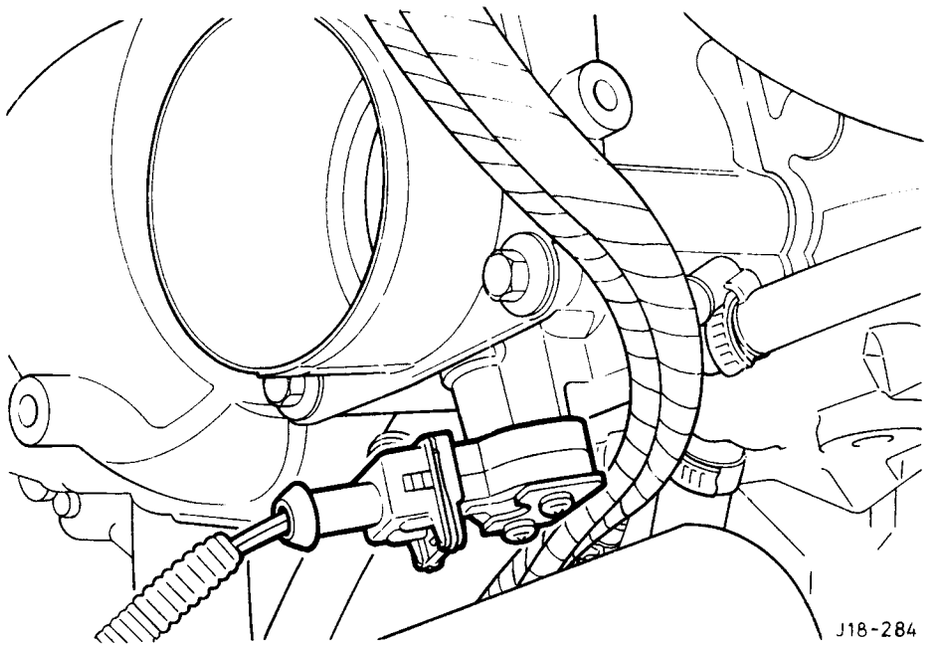


Fig. 1 TPS Location

5.1

Description

The CTS 518 Throttle Position Sensor (TPS) is situated under the throttle housing and locates on the slotted end of the throttle spindle. It is not possible to move the sensor position to effect adjustment, the ECM will adapt to the TP position and compensate for ageing and wear of components. The analogue voltage signal supplied to the ECM is proportional to throttle angle.

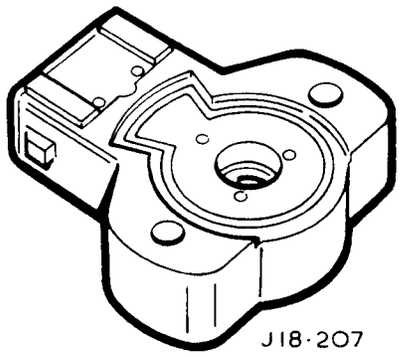


Fig. 1 TP Sensor

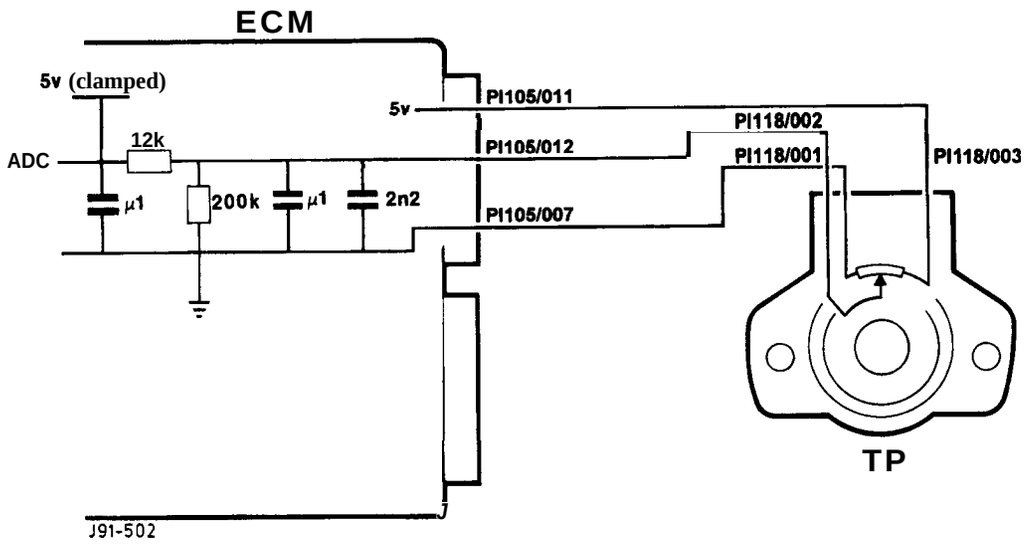


Fig. 2 TP Circuit

TP Circuit Range / Performance — *P 0121*

Possible causes:

- Engine unable to breathe properly – blocked inlet or exhaust system
- TP harness / connector partial short circuit or open circuit – undetected by range checks
- ECM stepper position is wrong but undetected
- TP faulty
- MAFS signal is wrong but undetected
- IAT sensor is wrong but undetected
- Extreme altitude barometric conditions and limit components have been encountered
- ECM engine speed value is wrong

TP Position Circuit low Input — *P 0122*

A range check on the output of the throttle position sensor is performed to check for input values outside expected limits.

- High voltage threshold: 4.0V
- Low voltage threshold: 0.15V

High voltage test not performed at engine loads greater than 0.36 g/s.
High voltage test counter not incremented until all conditions for test failure have been present for longer than 5 seconds.

Possible causes:

- Partial short circuit to ground or open circuit in TP signal wire / connectors
- TP supply low – wiring / connectors high resistance
- TP faulty low out of range
- ECM fault in Analogue to Digital Conversion (ADC) and interface circuit – gives low volts

TP Circuit High Input — *P 0123*

A range check on the output of the throttle position sensor is performed to check for input values outside expected limits.

- High voltage threshold: 4.0V
- Low voltage threshold: 0.15V

High voltage test not performed at engine loads greater than 0.36 g/s
High voltage test counter not incremented until all conditions for test failure have been present for greater than 5 seconds.

Possible causes:

- TP ground harness / connectors open circuit
- TP faulty high out of range
- ECM load signal is wrong (too low) but undetected
- ECM fault in Analogue to Digital Conversion (ADC) and interface circuit gives high volts

THROTTLE POSITION SENSOR – RENEW

SRO 18.30.17

Refer to Fig. 1.

- Open the hood and fit a wing cover.
- Open the trunk and remove the battery cover.
- Disconnect the battery ground lead.
- Disconnect the throttle position sensor multi-plug.
- Undo and remove the throttle position sensor to throttle housing securing screws.

Note: Remove the securing screw towards the front of the vehicle first.

- Displace and remove the throttle position sensor retaining plate.
- Remove the throttle position sensor.
- Clean the throttle housing mating face.
- Fit and fully seat the new throttle sensor to the throttle housing, making sure it engages correctly on the spindle.
- Fit and align the retaining plate.
- Fit the securing screw towards the rear of the vehicle. Do not fully tighten at this stage.
- Fit and tighten the securing screw towards the front of the vehicle.
- Fully tighten the rear securing screw.

Note: Make sure the throttle position sensor remains correctly engaged during fitting.

- Reconnect the harness multi-plug.
- Reconnect the battery ground lead.
- Refit the battery cover.
- Carry out engine setting procedure using Jaguar Diagnostic equipment.

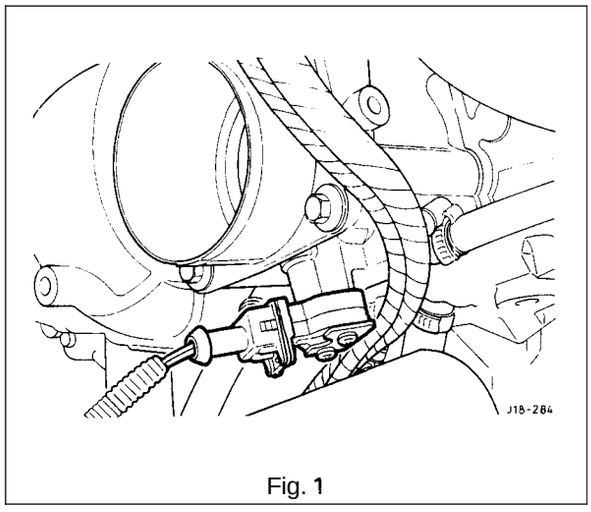


Fig. 1

5.1

HEATED OXYGEN SENSOR – HO2S

Group 5

P 0131 / P 0132
P 0133
P 1137 / P 0137
P 1138 / P 0138
P 0139 / P 0151
P 0153 / P 0152
P 1157 / P 0157
P 1158 / P 0158
P 0159

Monitoring Procedure

The oxygen sensors are first tested when a fuel system fault is suspected; the results of further periodic tests on the response rate of the sensors are compared to standards.

If a sensor is faulty, then the default will be to switch to using fuel feedback control on the diagnostic sensor for that bank, and if that sensor is not working correctly then the next default action will be to switch to open loop fuelling. If the test response rate is lower than the standard then the test will fail; the output will also be monitored to determine maximum and minimum signal voltages and if these are not within the limits then the test will fail. If these tests are not passed then a fault event is recorded and if the count exceeds a given limit then a fault is registered.

The strategy will report to the Diagnostic Status Manager (DSM) when all the tests have been performed once; the DSM will then decide whether to store a fault code and illuminate the MIL Lamp.

The Heated Oxygen Sensors (HO2S) are situated upstream and downstream the catalysts in the exhaust system and are identified as follows:

Bank 1 – Cylinders 1 to 3 – forward exhaust system
Bank 2 – Cylinders 4 to 6 – rearward exhaust system
Sensor 1 – Sensor upstream of the catalyst – close to the cylinder head
Sensor 2 – Sensor downstream of the catalyst – away from the cylinder head

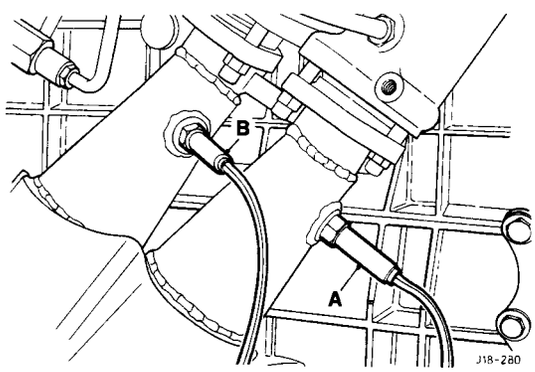


Fig. 1 Upstream sensors
A – Bank 1 Sensor 1
B – Bank 2 Sensor 1

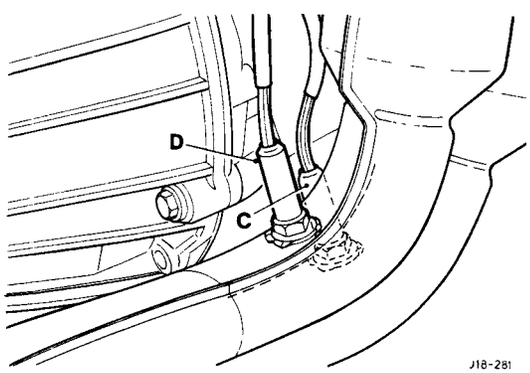


Fig. 2 Downstream Sensors
C – Bank 1 Sensor 2
D – Bank 2 Sensor 2

Note: HO2S sensors and harness connectors are not identified as to position, so when sensors, harness or exhaust arechanged they must be labelled to enable correct reconnection and location. Failure to observe this precaution may require the use of a Jaguar Diagnostic equipment to reprogramme the ECM.

Description

The NTKTO 19HO2S is used in the three way catalytic converter system to accurately monitor exhaust gas for correct air / fuel mixture.

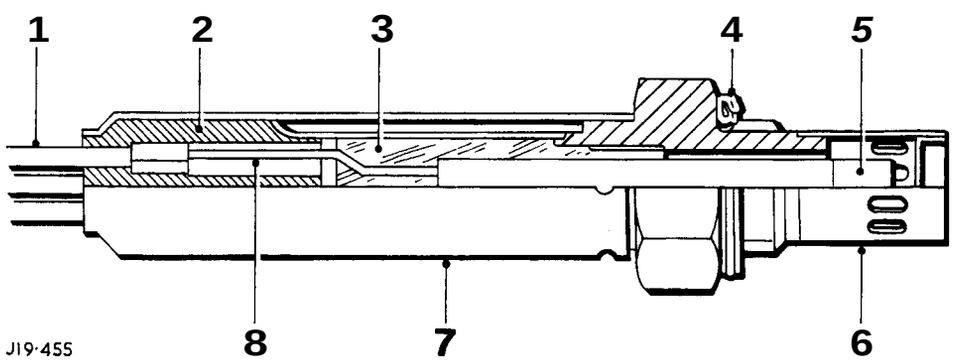
The sensors are of the Titanium Dioxide (TiO2) type, which have a tip, composed of an alumina substrate with a thick film titanium dioxide element. The Ti02 sensor does not require reference air to detect the oxygen content of the exhaust, so flooding or contamination of the sensor exterior will not affect sensor performance. The resistance of the sensor element varies greatly with the partial pressure of oxygen in the exhaust gas. This change in resistance is converted to a change in voltage output to the ECM via a constant voltage source and reference resistance. Whenever the air / fuel ratio passes lambda–I (stoichiometric mixture), the sensor delivers a voltage swing, indicating whether the mixture is richer or leaner than lambda–I.

The sensor resistance also varies with temperature and so a heater is used to maintain a constant tip temperature of approximately 800°C. It takes approximately 20 seconds from engine start for the sensors to reach an active temperature of approximately 500°C.

5.1

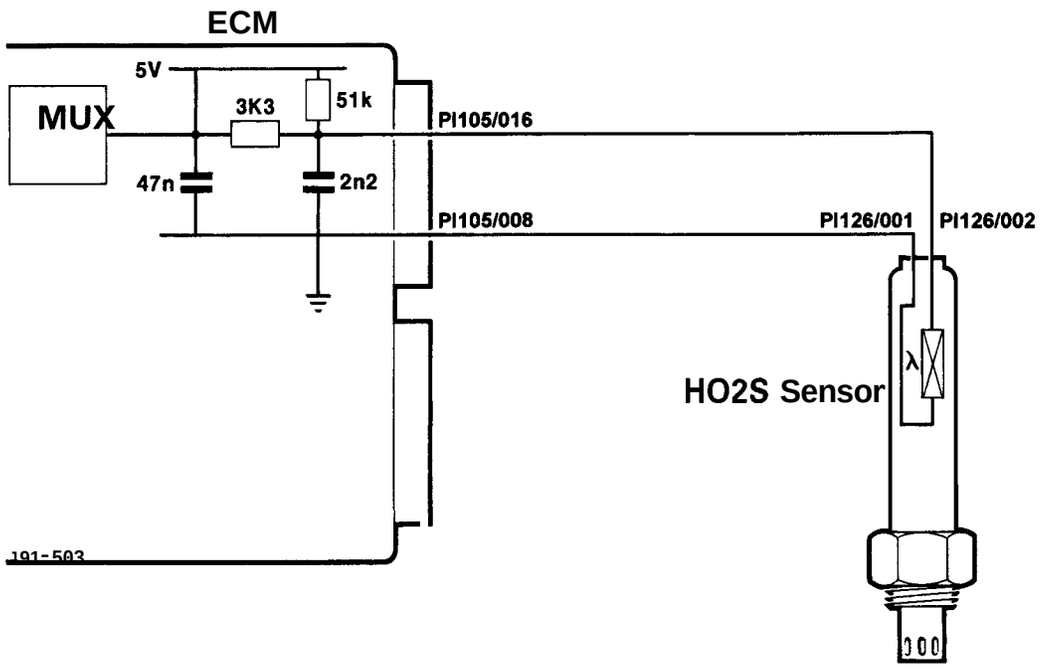
Catalyst equipped vehicles must use unleaded fuel; the use of one tank of leaded fuel will have a damaging effect on catalyst and sensor efficiency. The importance of using unleaded fuel is emphasised by labels fitted to the filler neck panel and the fuel gauge area of the fascia. The fuel filler neck is designed to accommodate only unleaded fuel pump nozzles.

Note: With the exception of France and Germany, labels denoting unleaded fuel are not fitted to UK and European vehicles.



1. Lead Wire
2. Silicon Rubber Plug
3. Glass Seal
4. Gasket
5. TiO2 Tip
6. Cover
7. Shell
8. Lead Wire

Fig. 1 HO2S Section



Fia. 1 HO2S Circuit - HO2S No. 1 Only

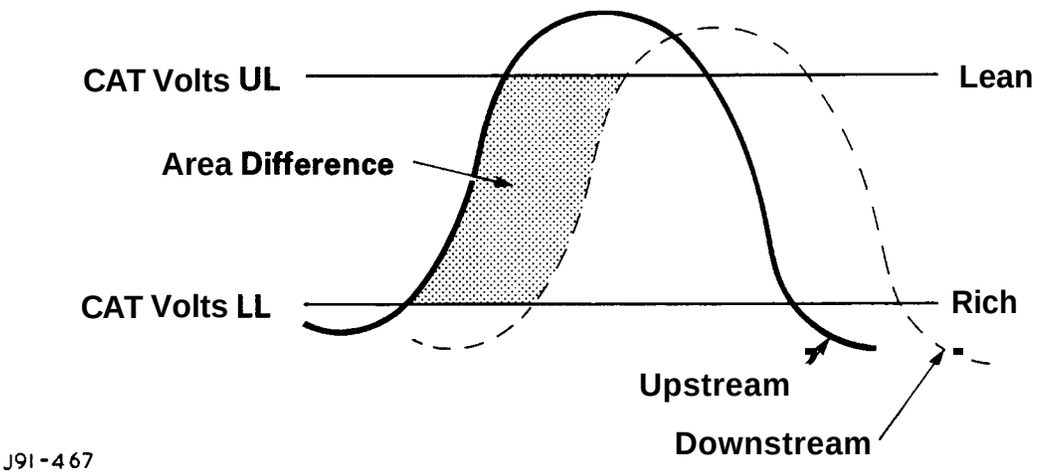


Fig. 2 HO2S Characteristic

HO2S Circuit Low Voltage – Bank 1 Sensor 1 **P 0131**
HO2S Circuit Low Voltage – Bank 1 Sensor 2 **P 0137**
HO2S Circuit Low Voltage – Bank 2 Sensor 1 **P 0151**
HO2S Circuit Low Voltage – Bank 2 Sensor 2 **P 0157**

The output voltage of the HO2S is monitored for values which are lower than the expected range. The HO2S low voltage threshold is **14.65** mV.

Possible causes of fault:

- HO2S signal wire short circuit to ground.
- HO2S fault.
- HO2S sensor tip too hot – heater error, or **loss** of full load enrichment.
- ECM interface circuit fault.

HO2S Circuit High Voltage – Bank 1 Sensor 1 **P 0132**
HO2S Circuit High Voltage – Bank 1 Sensor 2 **P 0138**
HO2S Circuit High Voltage – Bank 2 Sensor 1 **P 0152**
HO2S Circuit High Voltage – Bank 2 Sensor 2 **P 0158**

The output voltage of the sensor is monitored for values which are higher than the expected range. The 0 2 sensor high voltage threshold is **4.989** V

Possible causes of fault:

- HO2S disconnected
- HO2S ground or signal wire open circuit or short circuit to battery voltage
- HO2S tip too cold – heater error
- HO2S fault
- ECM – interface circuit fault

HO2S Circuit – Slow Response – Bank 1 Sensor 1 **P 0133**
HO2S Circuit – Slow Response – Bank 1 Sensor 2 **P 0139**
HO2S Circuit – Slow Response – Bank 2 Sensor 1 **P 0153**
HO2S Circuit – Slow Response – Bank 2 Sensor 2 **P 0159**

Periodic tests on the response rates of the sensors will be compared against reference rates, if the response is lower than the reference, then the test will fail.

Possible causes of fault:

- HO2S harness fault
- HO2S contaminated
- HO2S fault

Lack of HO2S Switch Indicates Lean – Bank 1 Sensor 2 ***P 1137***

Lack of HO2S Switch Indicates Lean – Bank 2 Sensor 2 ***P 1157***

The sensor output is monitored to determine the system control setting; if this is not within the required limits then the test will fail.

Tests are performed on the sensors to check for sensor output signals at eitherthe upper or lower limit values; if a signal, at a limit, is detected then fuelling changes will be introduced to move the signal off the limit. If this is successful then a fuelling fault is suspected.

Possible causes of fault:

- Exhaust air leak
- HO2S loose – not fitted correctly
- HO2S wiring fault – sensor open circuit
- HO2S heater problem – tip temperature too cold
- HO2S wires crossed
- HO2S failure – remains lean – high resistance
- ECM fault – HO2S input circuit fixed – indicating lean

Lack of HO2S Switch Indicates Rich – Bank 1 Sensor 2 ***P 1138***

Lack of HO2S Switch Indicates Rich – Bank 2 Sensor 2 ***P 1158***

5.1

The sensor output is monitored to determine the system control setting; if this is not within the required limits then the test will fail.

Tests are performed on the sensors to check for sensor output signals at either the upper or lower limit values; if a signal, at a limit, is detected then fuelling changes will be introduced to move the signal off the limit. If this is successful then a fuelling fault is suspected.

Possible causes of fault:

- HO2S wiring fault – sensor short circuit to ground
- HO2S heater problem – tip temperature too hot
- HO2S wires crossed
- HO2S failure – remains rich – low resistance
- ECM fault – HO2S input circuit fixed – indicating rich

HEATED OXYGEN SENSOR (HO2S), DOWNSTREAM – RENEW

SRO 18.30.66

The downstream heated oxygen sensors (HO2S) are situated after the catalytic converters (Fig. 1). The sensor, harness and connector must be renewed as a whole.

Note: HO2S and harness connectors are not identified as to position. When renewing sensors, label the harness connectors to ensure correct reconnection.

- Open the hood and fit a wing cover.
- Open the trunk and remove the battery cover.
- Disconnect the battery ground lead.

Note: The downstream HO2S harness connectors are bracket mounted on the left-hand side of the engine above the bell housing.

- Remove the bolt securing the HO2S harness connector bracket to the inlet manifold.
- Identify the downstream HO2S harness connector.
- Release the tang securing the HO2S harness connector to the bracket and disconnect.

  Cut and remove the ratchet strap securing the harness below the mounting bracket.
- Release the appropriate harness from the harness clips around the engine / bell housing joint.
- Remove the bolt securing the harness 'P' clip at the right hand side of the bell housing.
- Raise the vehicle.
- Displace and remove the harness **'P'** clip from the HO2S harness.
- Remove the sensor from the catalytic converter.
- Fit and fully seat a new sealing washer to a new HO2S.
- Fit and tighten the HO2S to the catalytic converter.
- Insert the HO2S harness into the 'P' clip. Fit and tighten the 'P clip to bell housing securing bolt.
- Lower the vehicle.
- Route the harness across the bell housing joint to the left-hand side of the engine, inserting the harness into the clips.
- Reconnect the HO2S connector and fully seat in the mounting bracket.
- Secure the HO2S harnesses together beneath the mounting bracket with ratchet straps.
- Align the connector mounting bracket to the inlet manifold and fit and tighten the securing bolt.
- Reconnect battery ground lead.
- Refit battery cover and close trunk.
- Remove wing cover and close hood.

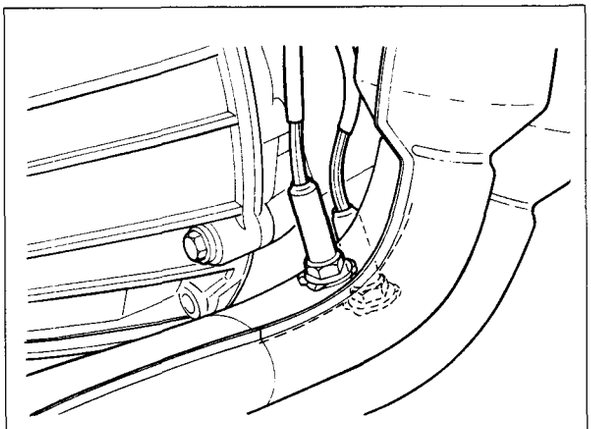


Fig. **1** J18 291

5.1

ADAPTIVE FUEL

Group 6

P 1171
P 0170
P 1172
P 0172
P 0174
P 0175
P 1176
P 1177
P 1178
P 1179

Monitoring Procedure

If the adaptive fuelling corrections exceed the limits then a fault is present and remains present until the system returns within the limits. There are limits on both the fuel and air mass flow rate corrections.

The strategy will report to the Diagnostic Status Manager (DSM) when a fuelling system fault is present and the DSM will then decide whether to store a fault code and illuminate the MIL lamp.

System Too Lean – Bank 1 – Reduced Flow *P 0171*
System Too Lean – Bank 2 – Reduced Flow *P 0174*

Possible causes:

- Exhaust air leak on A, B
- Misfire on that bank
- Oxygen sensor wiring problem – partial open circuit sensor A, B
- Partially blocked injector on that bank
- Oxygen sensor low Mark Space Ratio (MSR) – Sensor fault, lean shift on A, B
- ECM fault – interface or Analogue to Digital Convertor (ADC) problem with sensor input A, B

Lean Fuelling – Banks 1 and 2 *P 1171*

Possible causes:

- Run out of fuel
- Fuel pump relay fault – not driving pump
- Fuel pump failure – low pressure out of pump
- Low voltage supply to fuel pump
- Blocked fuel pipe or filter
- Fuel filter very dirty
- Pressure regulator fault – low fuel rail pressure
- Blocked injectors on both banks – dirty fuel
- Fuel pipe / rail leaks
- Wiring fault on injector supply, partial short circuit to ground
- Air flow meter low output
- Both oxygen sensors (A & B) fail to switch rich
- ECM fault – reads Battery Voltage Correction (BVC) wrongly (higher than actual)

System Too Rich – Bank 1 – Excess Flow ***P 0172***
System Too Rich – Bank 2 – Excess Flow ***P 0175***

Possible causes:

- Exhaust leak on A, B
- Misfire on that bank
- Oxygen sensor wiring problem – partial short circuit to ground, sensor A, B
- Leaky injector on that bank
- Oxygen sensor high Mark Space Ratio (MSR) – Sensor fault, rich shift on A, B
- ECM fault – interface or Analogue to Digital Convertor (ADC) problem with sensor input A, B

Rich Fuelling – Banks 1 and 2 ***P 1172***

Possible causes:

- Pressure regulator fault – high fuel rail pressure
- Blocked fuel pipe in return to tank
- Vacuum pipe ruptured between manifold and pressure regulator
- Leaking injectors on both banks
- Air flow meter high output
- Both oxygen sensors (A and B) fail to switch lean
- ECM fault – reads Battery Voltage Correction (BVC) wrongly (lower than actual)

5.1

lean Fuelling Trim, Long Term (FMFR) ***P 1176***

These tests monitor the performance of the adaptive fuelling system. There are limits on both fuel mass flow rate (FMFR) and air mass flow rate (AMFR). If the corrections it applies exceed these limits then the appropriate fault is present until the system returns within limits.

Possible causes:

- Fuel pump relay fault – not driving pump
- Low voltage supply to fuel pump
- Fuel pump failure – low pressure out of pump
- Blocked fuel pipe or fuel filter
- Fuel filter very dirty
- Pressure regulator fault – low fuel rail pressure
- Blocked injectors on both banks – dirty fuel
- Wiring fault on injector supply – partial short circuit to Ground
- Air flow meter low output
- Fuel pipe! rail leaks
- ECM fault – reads Battery Voltage Correction (BVC) wrongly (higher than actual)

Rich Fuelling Trim, Long Term (FMFR) — *P 1177*

These tests monitor the performance **of** the adaptive fuelling system. There are limits on both fuel mass flow rate (FMFR) and air mass flow rate (AMFR). If the corrections it applies exceed these limits then the appropriate fault is present until the system returns within limits.

Possible causes:

- Blocked fuel pipe in return to tank
- Pressure regulator fault – high fuel rail pressure
- Vacuum pipe ruptured between manifold and pressure regulator
- Leaking injectors on both banks
- Air flow meter high output
- Injector problem – high flow or leaky injectors
- One or both oxygen sensor get a rich bias – sensor fault
- ECM fault – reads Battery Voltage Correction (BVC) wrongly (lower than actual)

Lean Fuelling Trim, Long Term (AMFR) — *P 1178*

These tests monitor the performance of the adaptive fuelling system. There are limits on both fuel mass flow rate (FMFR) and air mass flow rate (AMFR). If the corrections it applies exceed these limits then the appropriate fault is present until the system returns within limits.

Possible causes:

- Air leak in inlet manifold
- Airflow meter low output
- ECM fault – reads Battery Voltage Correction (BVC) wrongly (higher than actual)

Rich Fuelling Trim, Long Term (AMFR) — *P 1179*

These tests monitor the performance of the adaptive fuelling system. There are limits on both fuel mass flow rate (FMFR) and air mass flow rate (AMFR). If the corrections it applies exceed these limits then the appropriate fault is present until the system returns within limits.

Possible causes:

- Air leak in exhaust
- Air flow meter high output
- ECM fault – reads Battery Voltage Correction (BVC) wrongly (lower than actual)

HEATED OXYGEN SENSOR – HO2S (HEATER)

Group 7

P 1185 / P 1186
P 1187 / P 1188
P 1189 / P 1190
P 1191 / P 1192
P 1193 / P 1194
P 1195 / P 1196

Monitoring Procedure

The heaters are connected to the ECM in pairs and hardware detection will provide indication of both heaters in a pair open circuit or, one or both heaters short circuit. The heater current and average output tests use the closed loop tip temperature control system to indicate faults and, if this system is unable to control tip temperature satisfactorily, then a number of faults can be detected.

If a fault is registered, the system will default to operating the heaters whenever the fuel pump is on, except when engine speed and load are above limits.

The strategy will report to the Diagnostic Status Manager (DSM) when an oxygen sensor heater fault is present and the DSM will then decide whether to store a fault code and illuminate the MIL lamp.

5.1

The Heated Oxygen Sensors (HO2S) are situated before and after the catalysts in the exhaust system and are identified as follows:

Bank 1 – Cylinders 1 to 3 – forward exhaust system
Bank 2 – Cylinders **4** to ***6*** – rearward exhaust system

Sensor 1 – Sensor upstream of the catalyst – close to the cylinder head
Sensor 2 – Sensor downstream of the catalyst – away from the cylinder head

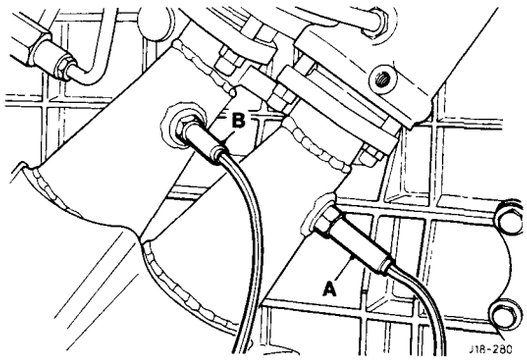


Fig. 1 Upstream sensors
A – Bank 1 Sensor 1
B – Bank 2 Sensor 1

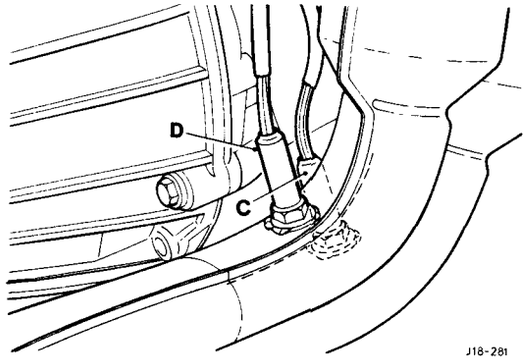
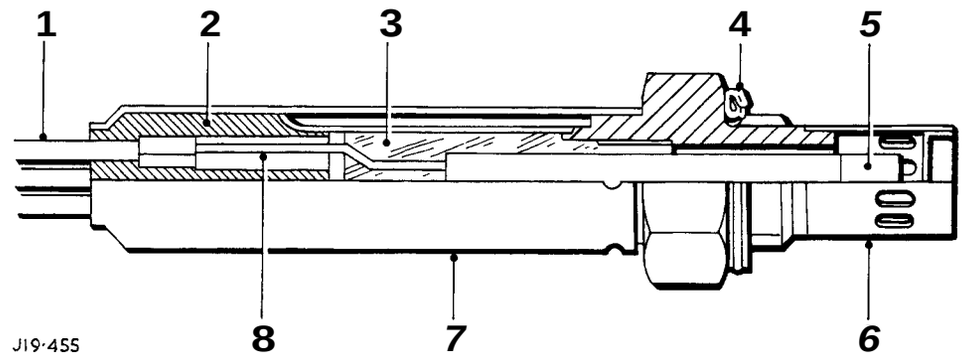


Fig. 2 Downstream Sensors
C – Bank 1 Sensor 2
D – Bank 2 Sensor 2

Note: HO2S sensors and harness connectors are not identified as to position, **so** when sensors, harness or exhaust are changed they must be labelled to enable correct reconnection and location. Failure to observe this precaution may require the use of a Jaguar Diagnostic equipment to re–programme the ECM.



1. Lead Wire
2. Silicon Rubber Plug
3. Glass Seal
4. Gasket
5. TiO2 Tip
6. Cover
7. Shell
8. Lead Wire

Fig. 1 HO2S Section

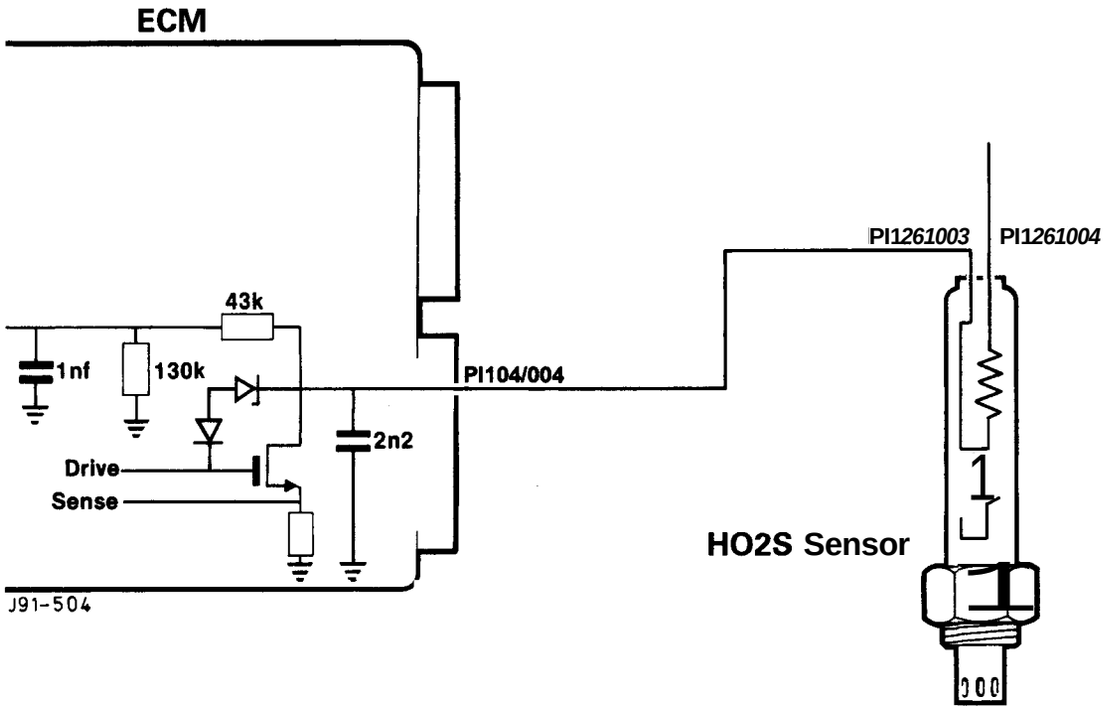


Fig. 2 HO2S Circuit

The HO2S resistance varies with temperature and so a heater is used to maintain a constant tip temperature of approximately 700°C. At this temperature the sensor output will be 3.3V for lean running and 1.1V for rich running.

HOZS Sensor Heater Open Circuit – Banks 1 and 2 Sensor 1 **P 1185**
HOZS Sensor Heater Open Circuit – Banks 1 and 2 Sensor 2 P 1191

Possible causes:

- Heater wiring open circuit
- ECM to heater connector open circuit
- ECM to heater wiring is short circuit to ground
- Both heaters open circuit supply – harness or connector faults
- Both heaters open circuit – sensor
- ECM hardware monitor fault implying open circuit heaters

HO2S Sensor Heater Short Circuit – Banks 1 and 2 Sensor 1 P 1186
HOZS Sensor Heater Short Circuit – Banks 1 and 2 Sensor 2 P 1192

The heaters are connected to the ECM; hardware detection will provide indication of both heaters open circuit and one or both heaters short circuit.

Possible causes:

- ECM to heater wiring is short circuit to voltage source
- Both heaters short circuit – sensor
- ECM hardware monitor fault implying short circuit heaters

HO2S Sensor Heater Open Circuit – Inferred – Banks 1 and 2 Sensor 1 P 1187
HO2S Sensor Heater Open Circuit – Inferred – Banks 1 and 2 Sensor 2 P 1193

The heaters are connected to the ECM in pairs; hardware detection will provide indication of both heaters open circuit and one or both heaters short circuit.

Possible causes:

- Heater harness high resistance or open circuit
- Excessive ignition retard causing hot exhaust gases
- Both heaters high resistance
- Incorrect test timing – air flow meter problem
- Incorrect heater calibration – ECM programming
- ECM fault – heater control system

HO2S Sensor Heater – Resistance – Banks 1 and 2 Sensor 1 ***P 1188***
HO2S Sensor Heater – Resistance – Banks 1 and 2 Sensor 2 ***P 1194***

The heater current and average output tests use the closed loop tip temperature control system to indicate faults. If the closed loop system is unable to control tip temperature then faults will be detected.

Possible causes:

- ECM to heater wiring is open circuit
- ECM to heater wiring is part open circuit
- ECM to heater wiring is short circuit to ground
- Battery voltage low and battery voltage sensing
- Both heaters are high resistance or open circuit – sensor
- ECM heater current monitor reads low
- Incorrect heater calibration
- ECM current sense resistor

HO2S Sensor Heater Circuit Low Resistance – 1 – Banks 1 and 2 Sensor 1 ***P 1189***
HO2S Sensor Heater Circuit Low Resistance – 1 – Banks 1 and 2 Sensor 2 ***P 1195***

5.1

The heater current and average output tests use the closed loop tip temperature control system to indicate faults. If the closed loop system is unable to control tip temperature then faults will be detected.

Possible causes:

- HO2S out of exhaust
- Heater harness short circuit
- Low battery voltage
- Incorrect test timing – air flow meter problem
- HO2S heater low resistance
- Incorrect heater calibration – ECM programming

HO2S Sensor Heater Circuit Low Resistance – 2 – Banks 1 and 2 Sensor 1 ***P 1190***
HO2S Sensor Heater Circuit low Resistance – 2 – Banks 1 and 2 Sensor 2 ***P 1196***

The heater current and average output tests use the closed loop tip temperature control system to indicate faults. If the closed loop system is unable to control tip temperature then faults will be detected.

Possible causes:

- ECM to heater wiring short circuit to a voltage source
- Excess heater current – battery voltage **> 17V**
- Both heaters low resistance or short circuit
- ECM heater current monitor reads high – ECM fault
- Incorrect heater calibration – ECM programming
- ECM current sense resistor

Additional Information

Fig. 1 shows a graph of sensor resistance with respect to the tip temperature; GEMS controls the temperature of the tip to **700°C.**

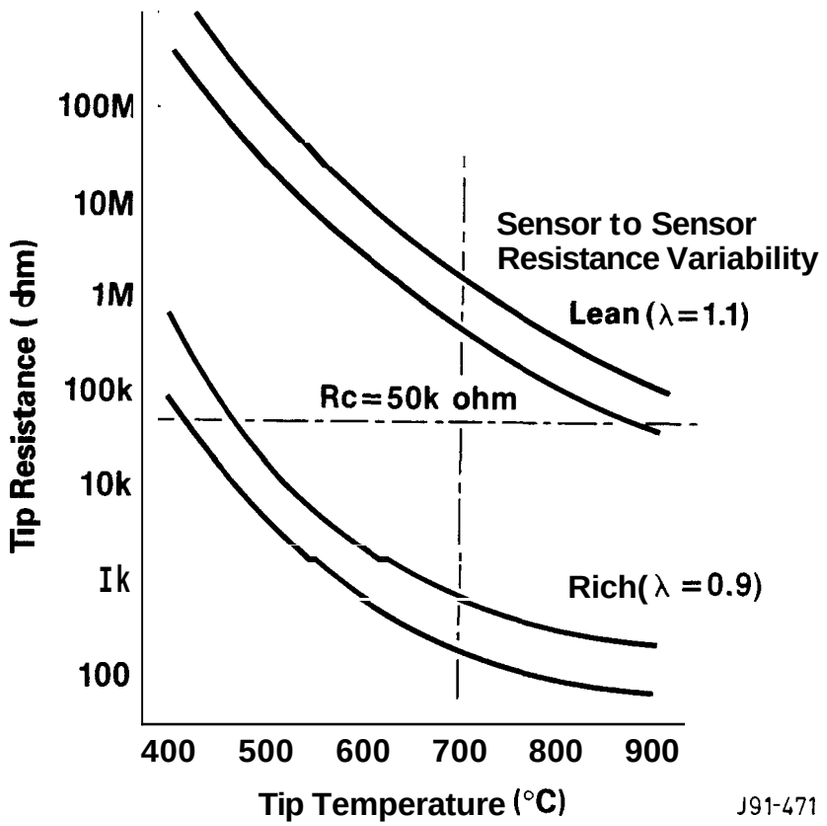
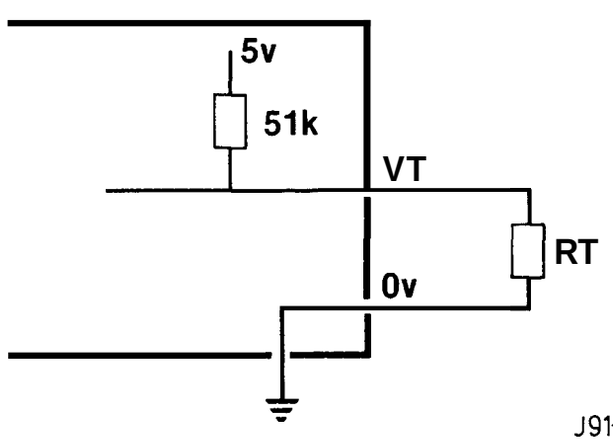


Fig. 1 Sensor Resistance with Respect to Temperature

The voltage level for any temperature may be calculated by taking the following readings and substituting them into the formula. Fig. **2** shows the test points.



Formula: $VT = \frac{RT}{(51K + RT)} \times 5V$

Example: At **700°C** Lean RT = 100k VT = 3.3V

Rich RT = **15K** VT = 1.1V

Fig. 2

INJECTORS

Group 9

P 1201 / P 0201
P 1202 / P 0202
P 1203 / P 0203
P 1204 / P 0204
P 1205 / P 0205
P 1206 / P 0206

5.1

Monitoring Procedure

Two double sampled tests are used to check injector operation.

The first test operates while the engine is running, the second operates during stall or power–down. When sufficient events have occurred to register a fault with the engine running a hardware fault is present. When sufficient events have occurred to register a fault with the engine stalled or during power–down, an injector ground short or open circuit fault is present. There is no injector default strategy.

The strategy will report to the Diagnostic Status Manager (DSM) when an injector fault is present and the DSM will then decide whether to store a fault code and illuminate the MIL Lamp.

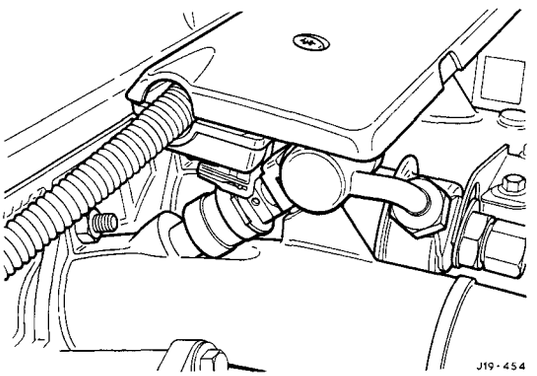


Fig. 1 Injector Location

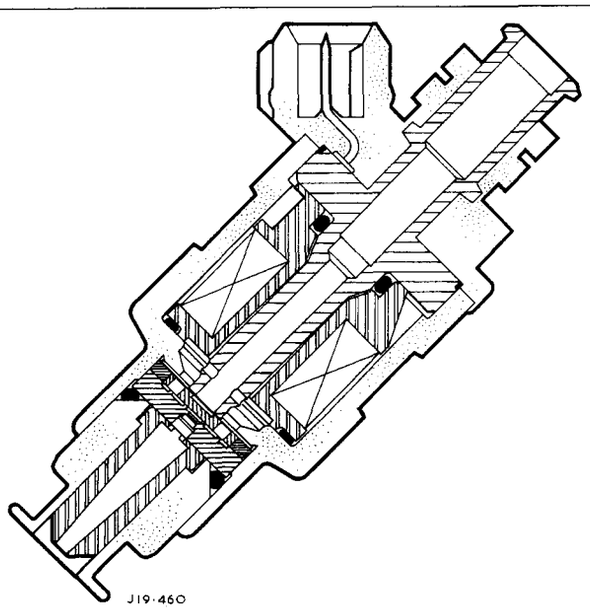


Fig. 2 Injector – Sectional View

Problems with the injectors may be detected using two tests; the first cannot distinguish between open circuit and short to battery or ground faults, the second isolates the short to battery condition.

Resistance - **15.9± 0.35Ω.** at 20°C.
At idle, pulse width is approximately 2.4ms.

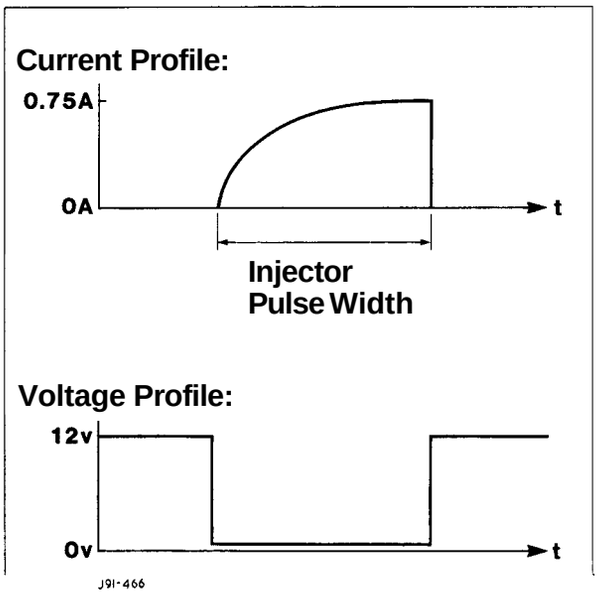


Fig. 1

5.1

Injector Circuit - Cylinder 1 ***P 0207***
Injector Circuit - Cylinder 2 ***P 0202***
Injector Circuit - Cylinder 3 ***P 0203***
Injector Circuit - Cylinder 4 ***P 0204***
Injector Circuit - Cylinder 5 ***P 0205***
Injector Circuit - Cylinder 6 ***P 0206***

Possible causes:

- Injector harness problem
- Injector coil fault
- ECM fault - injector drive circuit problem

Injector Circuit Open Circuit or Short Circuit :

Cylinder 1 ***P 1201***
Cylinder 2 ***P 1202***
Cylinder 3 ***P 1203***
Cylinder 4 ***P 1204***
Cylinder 5 ***P 1205***
Cylinder 6 ***P 1206***

Possible causes:

- Injector harness problem - injector N
- Injector coil fault - injector N
- ECM fault - injector drive circuit problem

FUEL RAIL /PRESSURE REGULATOR VALVE/ INJECTORS (NORMALLY ASPIRATED ENGINE), RENEW

SRO 19.60.13

SRO 19.45.11

SRO 18.10.01 INJECTORS

SRO 18.10.02 INJECTORS (VEHICLE SET)

WARNING: WORKING ON THE FUEL SYSTEM MAY RESULT IN FUEL AND FUEL VAPOUR BEING PRESENT IN THE ATMOSPHERE. FUEL VAPOUR IS EXTREMELY FLAMMABLE, HENCE GREAT CARE MUST BE TAKEN WHILST WORKING ON THE FUEL SYSTEM. ADHERE STRICTLY TO THE FOLLOWING PRECAUTIONS:

DO NOT SMOKE IN THE WORK AREA.

DISPLAY 'NO SMOKING' SIGNS AROUND THE AREA.

ENSURE THAT A CO_2 FIRE EXTINGUISHER IS CLOSE AT HAND.

ENSURE THAT DRY SAND IS AVAILABLE TO SOAK UP ANY FUEL SPILLAGE.

EMPTY FUEL USING SUITABLE FIRE PROOF EQUIPMENT INTO AN AUTHORIZED EXPLOSION-PROOF CONTAINER.

DO NOT EMPTY FUEL INTO A PIT.

ENSURE THAT WORKING AREA IS WELL VENTILATED.

ENSURE THAT ANY WORK ON THE FUEL SYSTEM IS ONLY CARRIED OUT BY EXPERIENCED AND WELL QUALIFIED MAINTENANCE PERSONNEL.

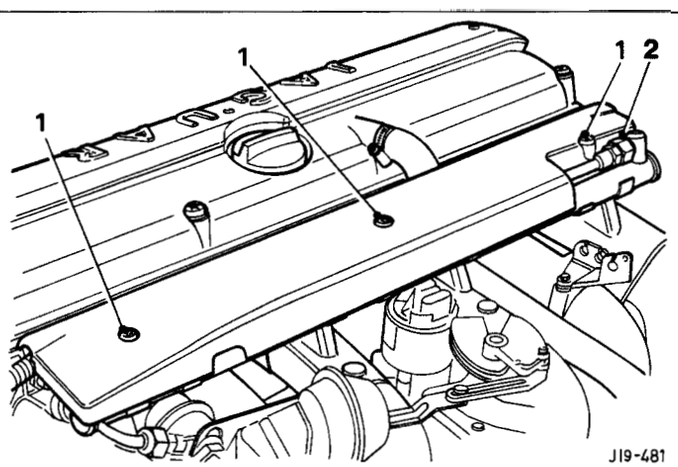


Fig. 1

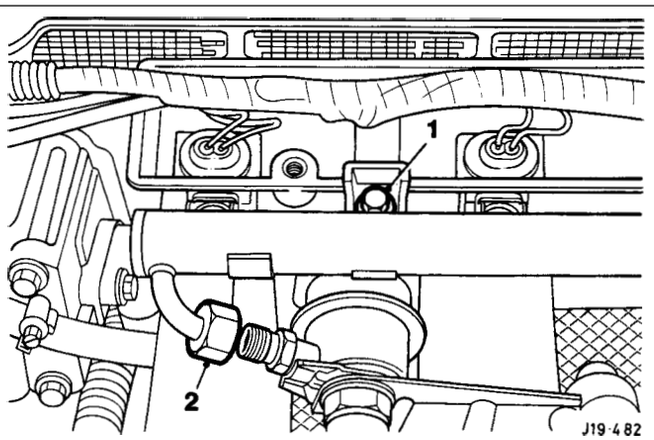


Fig. 2

Remove

- Reposition top edge of trunk front liner for access.
- Disconnect multi-plug from evaporative loss flange.
- Switch ignition on.
- Crank engine to depressurize fuel system.
- Switch ignition off.
- Disconnect battery, see Section 15.
- Disconnect ground lead eyelet from inlet manifold stud.
- Disconnect engine harness to oxygen sensor leads multi-plug.
- Disconnect engine harness to starter motor solenoid link lead multi-plug.
- Undo fuel injector multi-plug cover fixings (1 Fig.1, previous page).
- Disconnect cover (2 Fig.1, previous page) from injectors.
- Undo fuel rail to feed pipe union nut (2 Fig.2, previous page).
- Reposition fuel feed pipe from fuel rail union and fit blanking plugs to rail and pipe.
- Undo and remove regulator mounting bracket to inlet manifold bracket securing bolts.
- Undo fuel rail to regulator union nut.
- Reposition regulator from fuel rail union and fit blanking plugs.

5.1

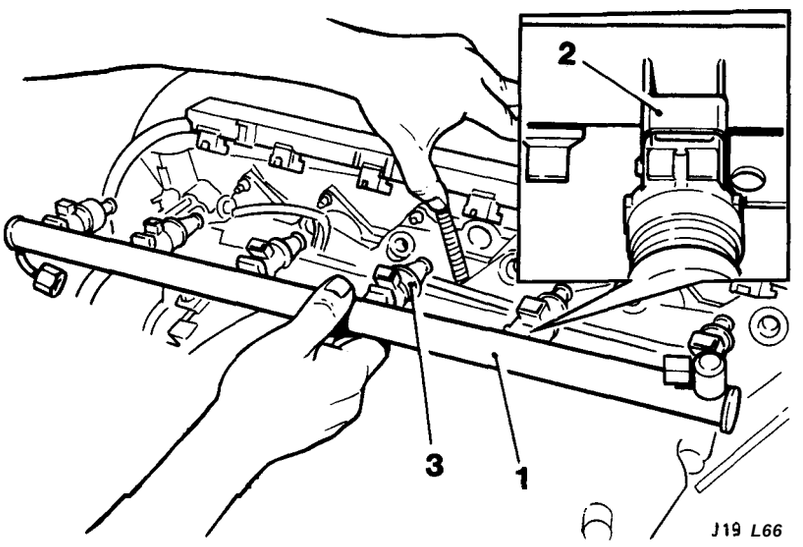


Fig. 1

- Undo and remove fuel rail securing bolts.
- Remove fuel rail assembly (1 Fig.1) from manifold.
- Fit blanking plugs to manifold.
- Drain the residual fuel from the fuel rail into a suitable drain tin.
- Remove the injector retaining clips (2 Fig.1).
- Remove injectors (3 Fig.1).
- Disconnect vacuum hose from regulator.
- Remove regulator mounting bracket.
- Undo fuel rail to regulator union nut.
- Remove regulator assembly.

Refit in the reverse order of the removal procedure.

MISFIRE

Group 10	*P 0300*
	P 0301
	P 0302
	P 1313 / P 0303
	P 1314 / P 0304
	P 1315 / P 0305
	P 1316 / P 0306

Monitoring Procedure

Two algorithms running in parallel are used to detect misfire, by monitoring variation in crankshaft period measurements. One algorithm detects rates less than one in five and the other, rates greater than one in five, of misfires per number of engine cycles. Variations in crankshaft period are compared to their respective speed and load limits and if the changes exceed the limit then a misfire has occurred. Faults are detected if the number of misfires in 200 or 1000 revolutions of the crankshaft exceed the limits.

The system is disabled during transient conditions, which could give false indications of a misfire.

The strategy will report to the Diagnostic Status Manager (DSM) when a misfire fault is present and the DSM will then decide whether to store a fault code and illuminate the MIL Lamp.

Random Misfire Detected — ***P 0300***

Possible causes:

- Low fuel pressure
- EGR valve stuck part open
- Fuel contaminated

Misfire Detected;

Cylinder 1	*P 0301*
Cylinder 2	*P 0302*
Cylinder 3	*P 0303*
Cylinder 4	*P 0304*
Cylinder 5	*P 0305*
Cylinder 6	*P 0306*

Possible causes:

- Harness fault – injector or coil – partial open circuit or short circuit
- Spark plug problems
- Injector fault
- Ignition coil fault
- ECM fault – ignition coil drive or injector drives

Misfire Rate, Catalyst Damage – Bank 1	*P 1313*
Misfire Rate, Catalyst Damage – Bank 2	*P 1314*

Possible causes:

- Harness fault – more than one cylinder or coil open circuit or short circuit
- Very low fuel pressure
- Crank sensor / harness problem
- ECM fault – ignition coil drive or injector drives

Persistent Misfire ***P 1315***

Possible cause:

- One cylinder identified and injector turned off

Misfire Rate Above Limit ***P 1316***

Possible causes:

- Harness faults – injectors or coils – partial open circuit or short circuit
- Spark plug problems
- **Low** fuel pressure
- Fuel contaminated
- ECM fault – ignition coil drive or injector drives

KNOCK SENSOR – KS

Group 11

P 0326
P 0327
P 0328
P 0331
P 0332
P 0333

Monitoring Procedure

Knock sensing faults are detected by using two tests. If the knock controller cannot adjust the background noise average to within limits then a knock sensor fault event is recorded and when the fault event counter reaches its limit, a low or high background noise knock fault is registered. If knock correction is at the maximum value for a set number of cycles then a continuous knock fault **is** registered.

The strategy will report to the Diagnostic Status Manager (DSM) when a knock sensing fault is present and the DSM will then decide whether to store a fault code and illuminate the MIL Lamp.

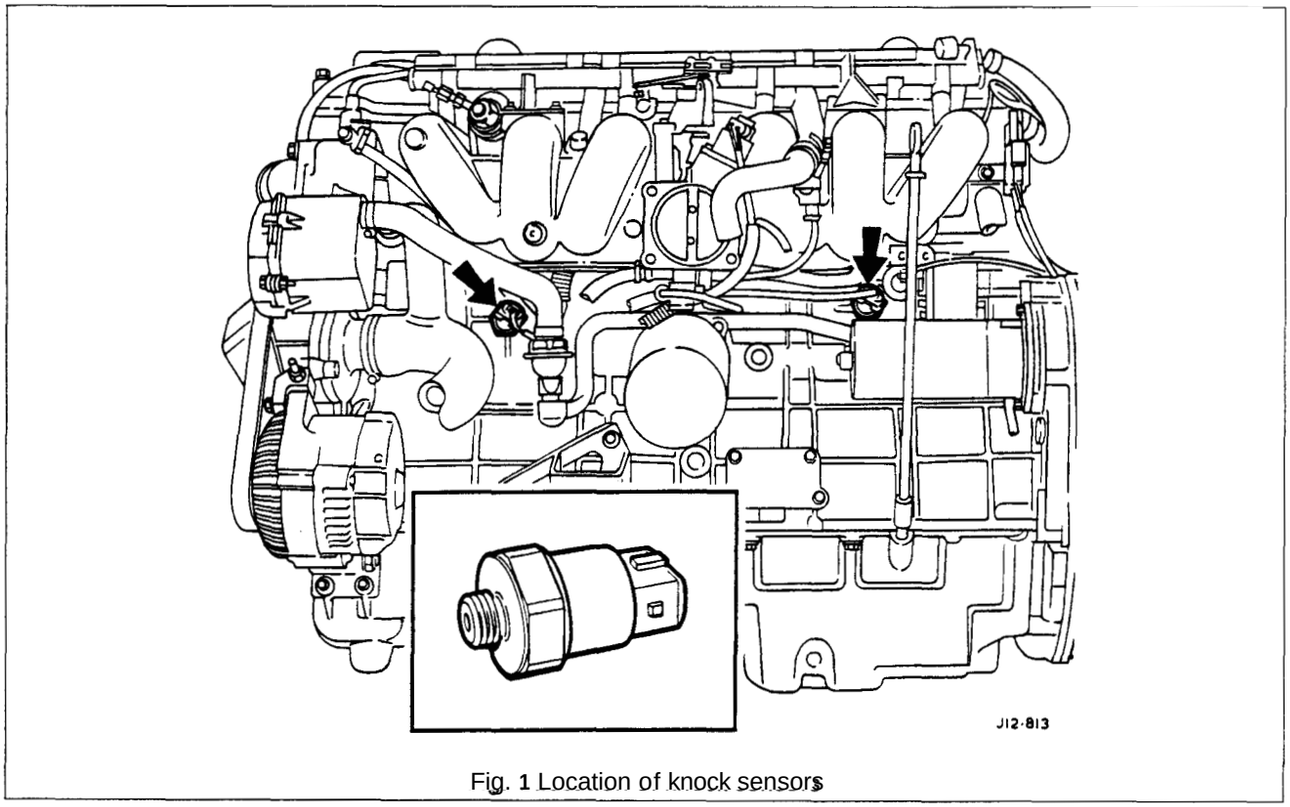


Fig. 1 Location of knock sensors

The knock sensor uses a piezo–electric sensing element to detect broad band (2–20 khz) engine accelerations. When the closed loop knock controller is unable to adjust the background noise average to within a defined band either side of the reference background noise average then a fault has occurred, and a relevant fault counter incremented.

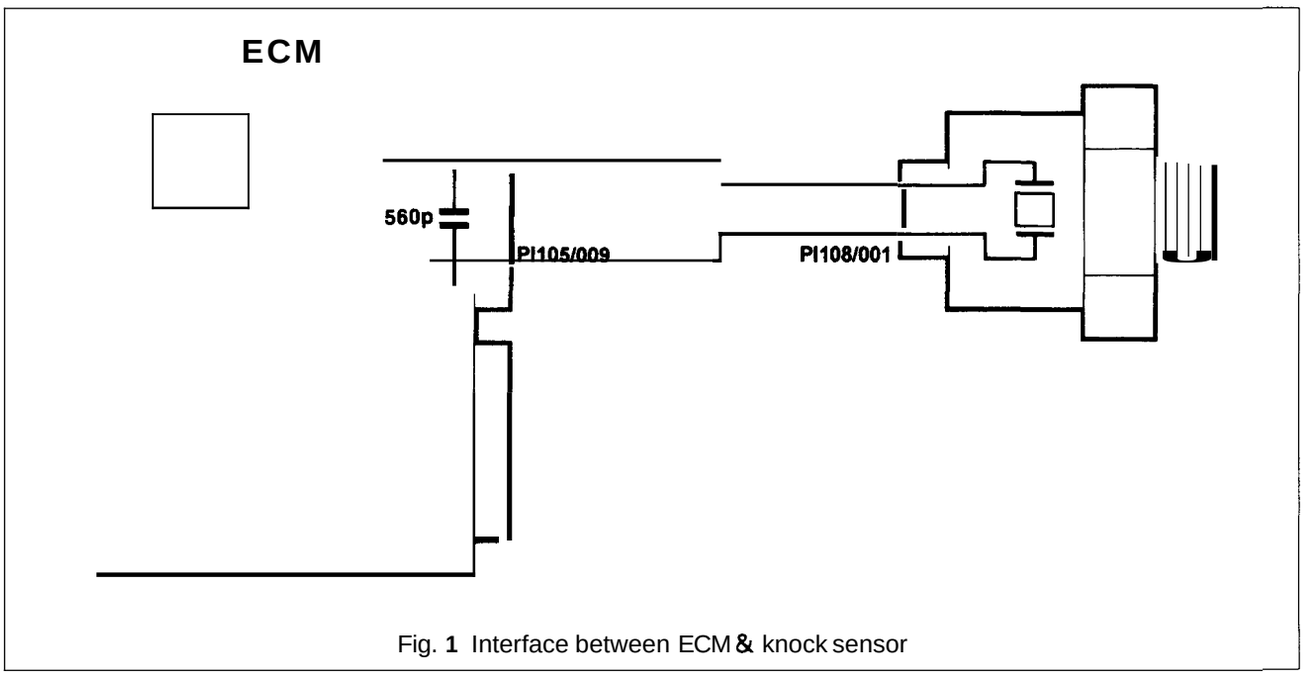


Fig. 1 Interface between ECM & knock sensor

5.1

KS 1 Circuit Range / Performance A, B ***P 0326***

KS 2 Circuit Range / Performance A, B ***P 0331***

When continuous knock detection on one or more cylinders has caused knock correction to reach it's maximum value and stay there for a predetermined number of cycles, then there is a knock sensor circuit range / performance fault.

Possible causes:

- Cylinder head overheats – loss of coolant
- Wrong fuel type used – low octane
- Cylinder deposits (on bank A,B)
- Quiet engine with background noise spikes causing retard A,B
- Radio Frequency Interference (RFI) affects knock signal – shielding problem with harness A,B
- ECM fault – knock ASIC fails

KS 1 Circuit Low Input A, B ***P 0327***

KS 2 Circuit Low Input A, B ***P 0332***

When the closed loop knock controller is unable to adjust the background noise average to within a defined band either side of the reference background noise, then a knock sensor fault event has occurred. If the knock fault event counter reaches a given threshold, then a low or high background noise knock fault is present.

Possible causes:

- Knock sensor A,B not in good acoustic contact with block e.g. loose
- Knock sensor wiring open circuit or short circuit to ground
- Background anomalously quiet for a cylinder on that bank
- Knock sensor signal attenuated – harness problem
- Knock sensor fault A,B, lost sensitivity
- ECM fault – knock ASIC failed

KS 1 Circuit High Input ***P 0328***

KS 2 Circuit High Input ***P 0333***

When the closed loop knockcontroller is unable to adjustthe background noise average to within a defined band either side of the reference background noise, then a knock sensor fault event has occurred. If the knock fault event counter reaches a given threshold, then a low or high background noise knock fault is present.

Possible causes:

- Background anomalously noisy for a cylinder on that bank
- Radio Frequency Interference (RFI) adds to knock signal – harness shielding problem
- Knock sensor A,B – over sensitive
- ECM fault – knock ASIC failed

Additional Information

Knock sensors use a piezo–electric sensing element to detect broad band (2 kHz to 20 kHz) engine accelerations.

Output of sensor: Charge sensitivity = 37.5 pC / g nominal
Voltage sensitivity = 29 + 15% mV / g

5.1

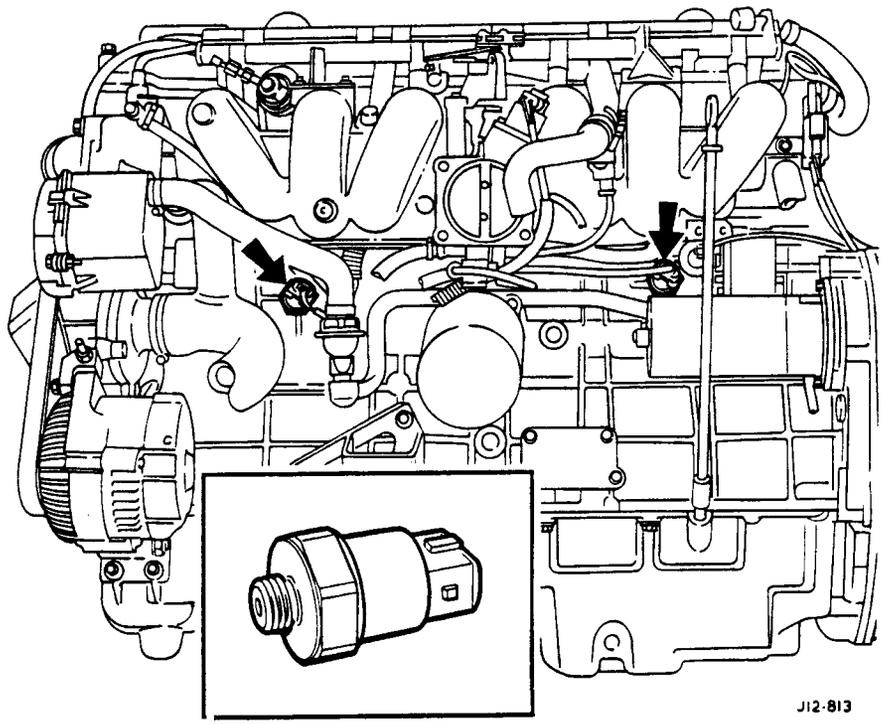
5.1

FRONT KNOCK SENSOR – RENEW

SRO 18.30.67

- Open the hood and fit a wing cover.
- Remove the battery cover.
- Disconnect the battery ground lead.
- Remove the air pump. See Section 5.1 of the VSM.
- Disconnect the knock sensor harness multi–plug.
- Undo and remove the front knock sensor.

Fitting a new front knock sensor is the reverse of the removal procedure.



Fia. 1

REAR KNOCK SENSOR – RENEW

SRO 18.30.68

- Open the hood and fit a wing cover.
- Remove the battery cover.
- Disconnect the battery ground lead.
- Raise the vehicle on a four post ramp
- From underneath the vehicle disconnect the knock sensor harness multi–plug.
- Undo and remove the knock sensor.

Fitting a new rear knock sensor is the reverse of the removal procedure.

CRANKSHAFT POSITION SENSOR – CKPS

Group 12

P 0335
P 0336

Monitoring Procedure

If CMP signals are detected which indicate engine rotation above a given speed without any signal from a crankshaft sensor, then a fault is present. If the crankshaft gear teeth count is incorrect by more than one tooth, then a fault event is registered and if the number of fault events exceeds the limit without the engine synchronising then a crankshaft inaccurate fault is present.

The strategy will report to the Diagnostic Status Manager (DSM) when a crankshaft inaccurate fault is present and the DSM will then decide whether to store a fault code and illuminate the MIL Lamp.

The CKP and CMP are tested by cross checking the output of the sensors and identifying when only one sensor is operating. **A** tooth position check will test that all tooth edges are being correctly detected and the 'missing tooth' gap is present. **As** the CKPS is central to engine management system operation the engine cannot run with a CKPS circuit fault.

The average engine speed is measured using the camshaft sensor during stall. If the engine speed is greater than a threshold then a crankshaft position sensor fault is present.

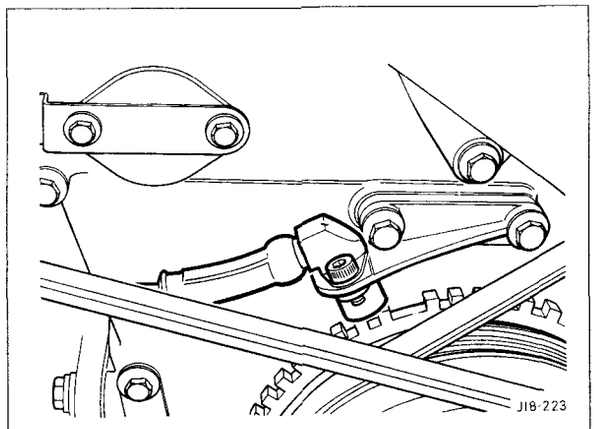


Fig. 1 Location of CKPS

5.1

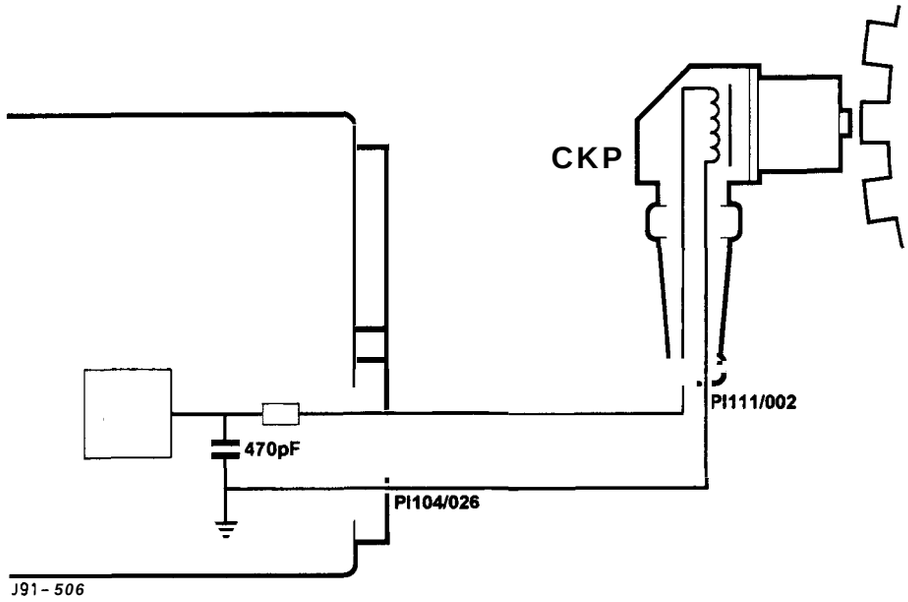


Fig. 2 Interface between ECM & CKPS

CKP Circuit ***P 0335***

Possible causes:

- Crank sensor not fitted correctly – hanging loose
- Reluctor ring fault – not fixed to crank
- Crank sensor harness open circuit or short circuit to ground
- Crank sensor fault
- ECM interface circuit fault

CKP Circuit Range / Performance ***P 0336***

The CKPS counts the number of teeth between the 'missing tooth' gaps. If the tooth count is incorrect by more than one tooth, above **or** below the actual number of teeth, then a missing tooth fault event has occurred. If a number of fault events occur without the engine synchronising then a crankshaft range / performance fault is present.

Possible causes:

- Damaged reluctor ring
- Magnetic debris on reluctor ring
- Radio Frequency Interference (RFI) problem with crank sensor wiring

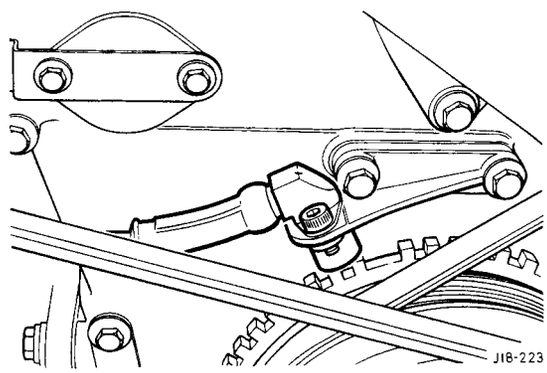
5.1

CRANKSHAFT POSITION SENSORS (CKPS) – RENEW

SRO 18.30.12

- Open the hood and fit a wing cover.
- Disconnect the CKPS harness multi–plug and release from the mounting bracket.
- Undo and remove the sensor securing bolt and remove the sensor.
- Clean the mating faces.

Fitting a new CKPS is the reverse of the removal procedure.



Fin. 1 Location of CKPS

CAMSHAFT POSITION SENSOR – CMPS

P 0340

Monitoring Procedure

If the engine is turned and there is no camshaft signal, then a camshaft sensor fault is present, so the system is synchronised using the crankshaft sensor alone. Synchronization ensures that ignition coils are actuated in the normal sequence but if after a number of engine revolutions the engine does not start, then the actuating sequence is shifted by one engine revolution. If after a number of engine revolutions the engine does not start, then the sequence shifting is repeated until the engine is running. To detect faults the crank and camshaft sensor outputs are cross checked plus a crankshaft 'missing tooth' position check.

The strategy will report to the Diagnostic Status Manager(DSM) when a crankshaft inaccurate fault is present and the DSM will then decide whether to store a fault code and illuminate the MIL Lamp.

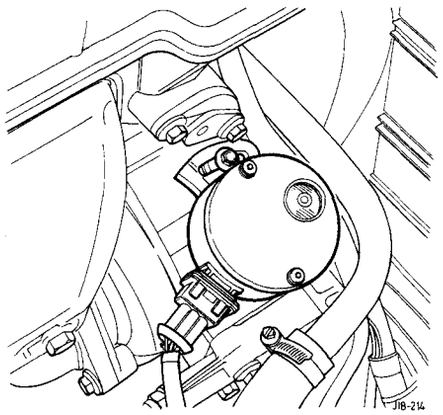


Fig. 1 Location of CMPS

5.1

The CKP and CMP are tested by cross checking the output of the sensors and identifying when only one sensor is operating.

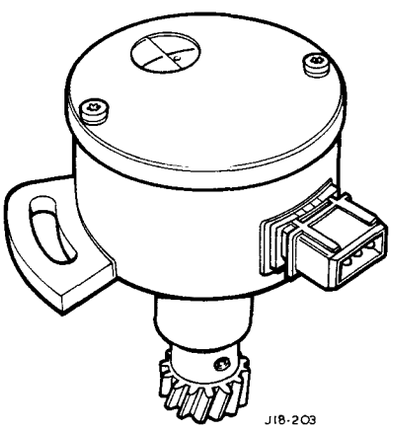


Fig. 2 CMPS

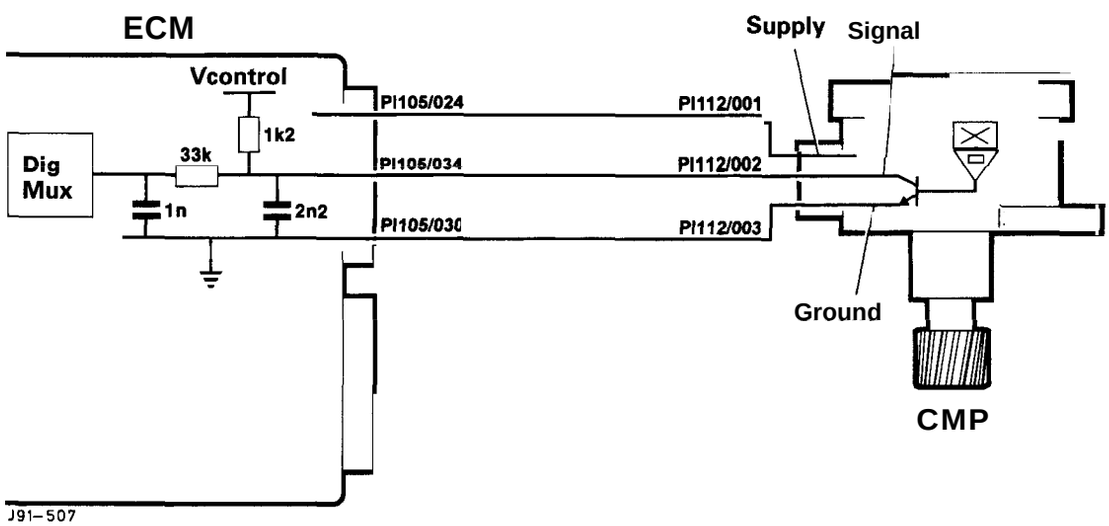


Fig. 3 Interface between ECM & CMP

CMP Circuit ***P 0340***

Possible causes:

- CMPS out of alignment
- Radio Frequency Interference problems on CMPS line
- CMPS sensor tooth damage
- CMPS sensor fault

5.1

IGNITION COILS

Group 13

P 1361 / P 1362
P 1363 / P 1364
P 1365 / P 1366
P 1371 / P 1372
P 1373 / P 1374
P 1375 / P 1376

Monitoring Procedure

Two tests on the current monitor signal, when the coils are turned on during normal engine running, check for the lack of, or early, activation, which will imply that the coil was not fully charged when it was fired or that the coil charged too quickly. If either of these tests is not passed then a fault event is recorded and when the limit is reached a fault is registered. The ignition coil driver circuits have a current limiting system which will attempt to maintain ignition coil operation with all fault conditions present.

The strategy will report to the Diagnostic Status Manager (DSM) when an ignition coil fault is present and the DSM will then decide whether to store a fault code and illuminate the MIL lamp.

5.1

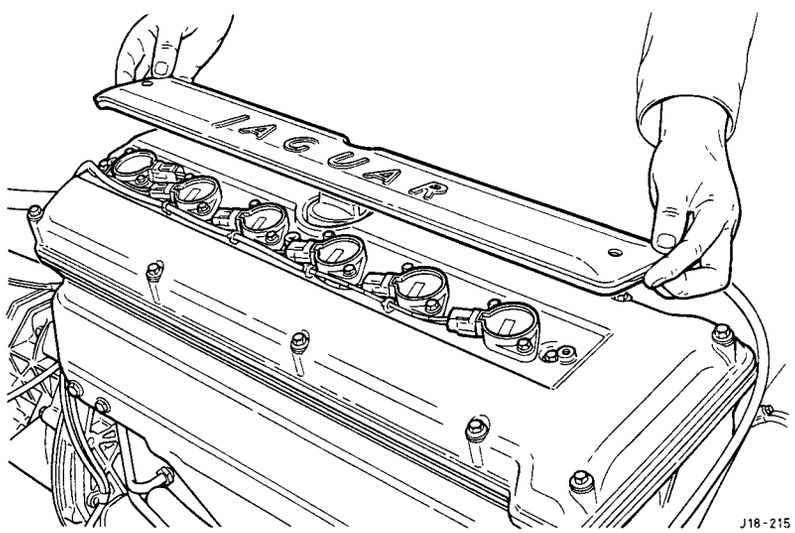
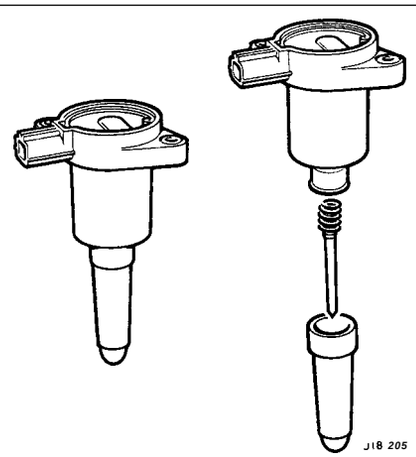


Fig. 1 Location of coils

The six sparking plugs each have individual ignition coils attached which are fitted flush with the camshaft cover and concealed beneath a central cover plate.

Resistance = 0.75 ohm.

The coil assembly consists of coil body with an integral two pin plug, a central electrode and extension housing. Problems with the ignition coils are detected using two tests on signals checking the coil current which analyse the current monitor signal when ignition coils are turned on during normal engine running. The coils are monitored to detect either non or early activation.



Fin. 2 Coil Assembly

Ignition Coil Cylinder 1 – No Activation **P 1361**
Ignition Coil Cylinder 2 – No Activation **P 1362**
Ignition Coil Cylinder 3 – No Activation **P 1363**
Ignition Coil Cylinder 4 – No Activation **P 1364**
Ignition Coil Cylinder 5 – No Activation **P 1365**
Ignition Coil Cylinder 6 – No Activation **P 1366**

Possible causes:

- Ignition coil open circuit, high resistance or inductance
- Ignition LT harness open circuit or high resistance
- Ignition LT harness short circuit to ground
- Crank sensor problems – 'ringing' **or** radio frequency interference on line
- ECM fault – ignition coil driver
- ECM fault – ignition coil current sensing problem

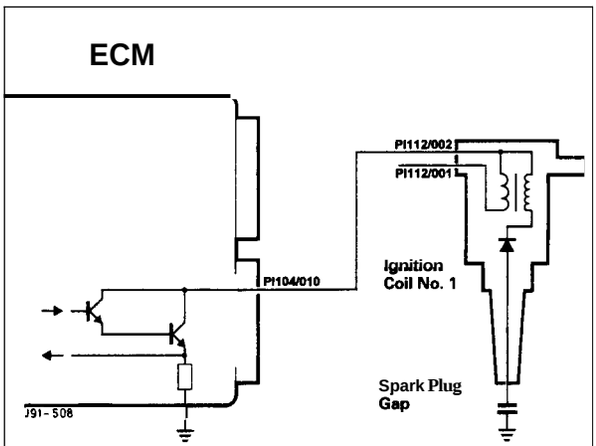


Fig. 1 Interface between ECM & coil

Ignition Coil Cylinder 1 – Early Activation **P 1371**
Ignition Coil Cylinder 2 – Early Activation **P 1372**
Ignition Coil Cylinder 3 – Early Activation **P 1373**
Ignition Coil Cylinder 4 – Early Activation **P 1374**
Ignition Coil Cylinder 5 – Early Activation **P 1375**
Ignition Coil Cylinder 6 – Early Activation **P 1376**

Possible causes:

- Ignition coil short circuit, low internal resistance or inductance
- Ignition LT harness short circuit
- Ignition coil fault – inter winding short circuit on secondary
- ECM fault – ignition coil driver
- ECM fault – ignition coil current sensing problem

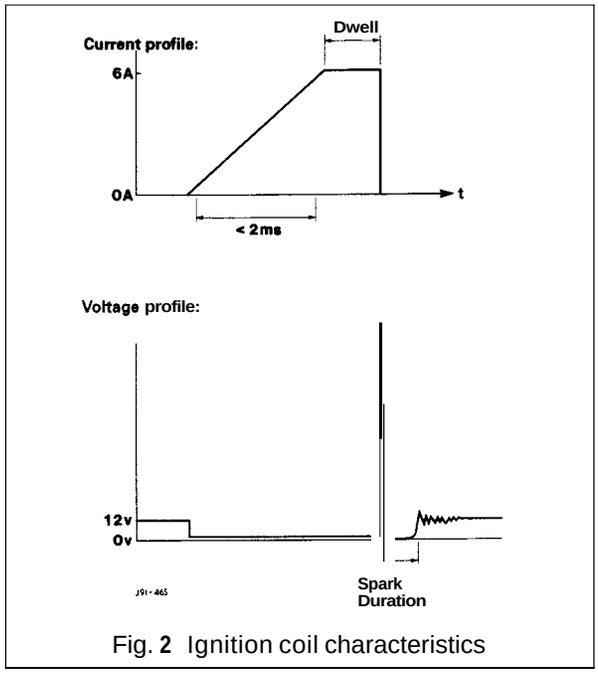


Fig. 2 Ignition coil characteristics

ON-PLUG IGNITION COIL - RENEW

SRO 18.20.36

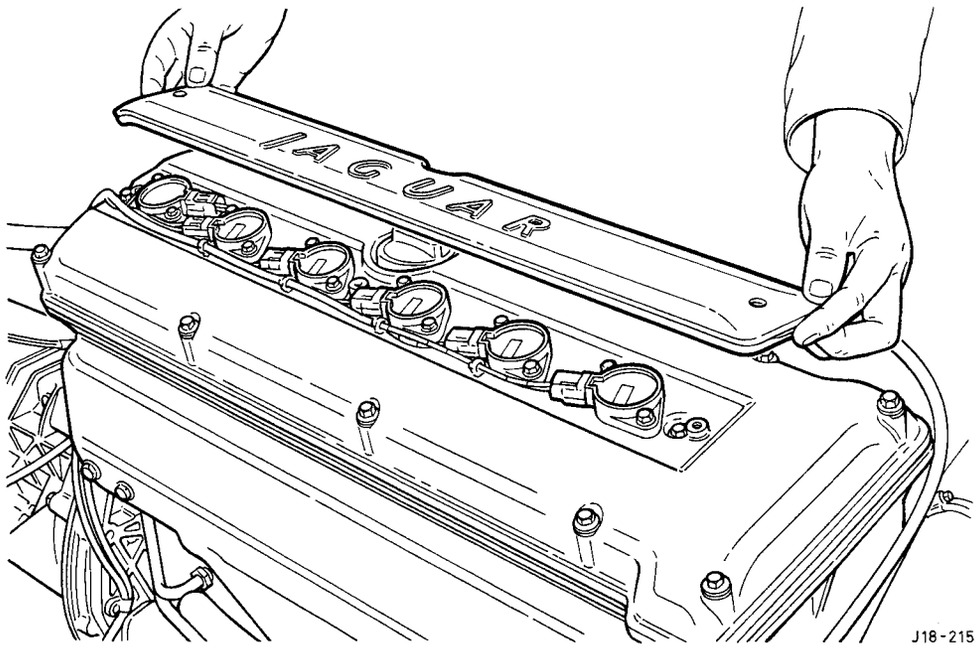


Fig. 1

- Open the hood and fit a wing cover.
- Remove the engine cover (Fig. 1).
- Disconnect the on-plug ignition coil multi-plug.
- Undo and remove the on-plug ignition coil securing bolts.
- Displace and remove the on-plug ignition coil. Remove and discard the gasket.
- Clean the gasket face.

Fitting a new on-plug ignition coil is the reverse of the removal procedure.

EXHAUST GAS RECIRCULATION - EGR

Group 14

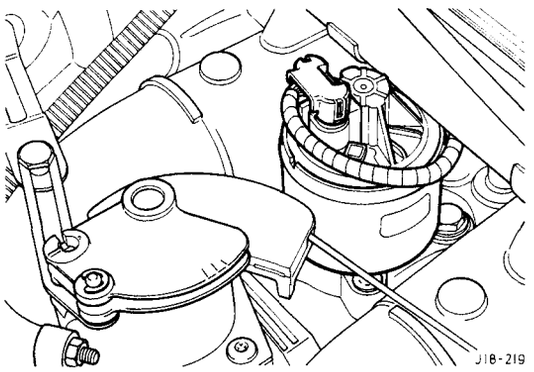
P 1400 / P 0400
P 1401
P 1408
P 1409

Monitoring Procedure

The diagnostics for the EGR valve are split into five parts. Rangetests check the EGR thermistor and the pintle position sensor. The controller and pintle position sensor are used to monitor the difference between the target and actual positions of the pintle.

The EGR thermistor is used to verify the flow of exhaust gas in the EGR system. The Pulse Width Modulated (PWM) drive circuit provides open / short circuit detection.

The EGR valve is situated on the inlet manifold between the throttle body and the cylinder head.



Fin. 1 Location of EGR valve

Pintle Control

The difference between the target and actual pintle positions is monitored; if it continually exceeds the limit over a set time period then a fault is registered.

Range Tests

The pintle position sensor input is monitored to detect a high or low out of range value; if it continually exceeds the limit over a set time period then a fault is registered. The EGR thermistor is monitored to detect a high out-of-range temperature.

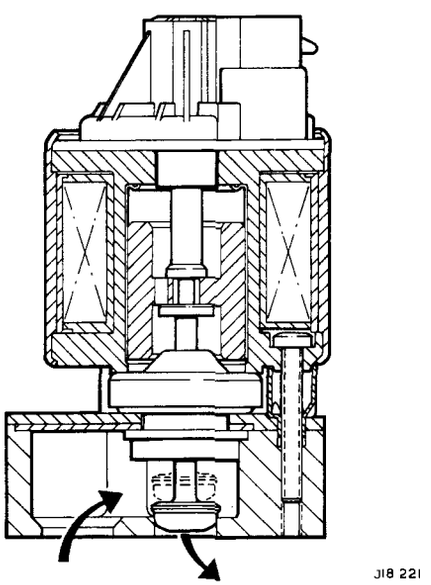


Fig. **2** EGR valve, section

Flow Rate

When the engine reaches test condition; i.e. engine speed and load are within limits, coolant and air temperatures are above the minimum setting and the throttle position is below the limit; the EGR temperature is monitored and if it does not rise above a limit within the set time period, then a fault event has occurred. When sufficient fault events have occurred then a fault is registered.

PWM Drive Hardware

The ECM, Pulse Width Modulated (PWM) drive hardware will report open or short circuit faults directly. If the Pintle position sensor has an out-of-range fault then the EGR will be disabled. The strategy will report to the Diagnostic Status Manager (DSM) when an EGR fault is present and the DSM will then decide whether to store a fault code and illuminate the MIL Lamp.

EGR Valve

The EGR valve consists of three main parts; the Solenoid, Pintle and Seat, and the Pintle Position Sensor. The Solenoid provides a unidirectional magnetic field to act upon the armature, which is connected to the Pintle. The resulting force acts to pull the Pintle away from the Seat **so** allowing exhaust gas to flow into the inlet manifold. Movement of the armature and pintle is resisted by three forces; pressure drop across the pintle and seat area, gravity, and spring load from the pintle position sensor.

The continuously variable control of the flow **of** exhaust gas into the inlet manifold is achieved by the pintle position sensor providing feedback to the **ECM** for closed loop control of the pintle position. Pintle position feedback allows the **ECM** to calculate fuel and spark corrections as well as exhaust gas flow rate. The **EGR** Function Sensor, situated on the inlet manifold between the throttle body and the **EGR** valve, is used to verify the flow of exhaust gas in the **EGR** system.

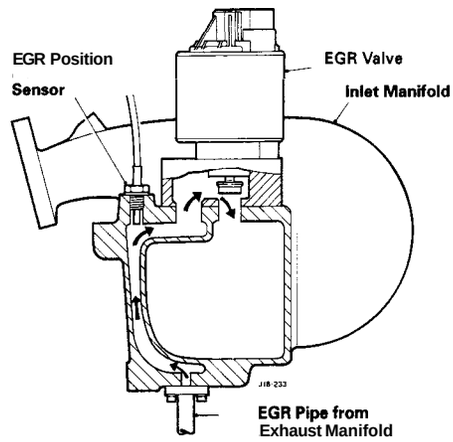


Fig. 1 **EGR &** manifold, section

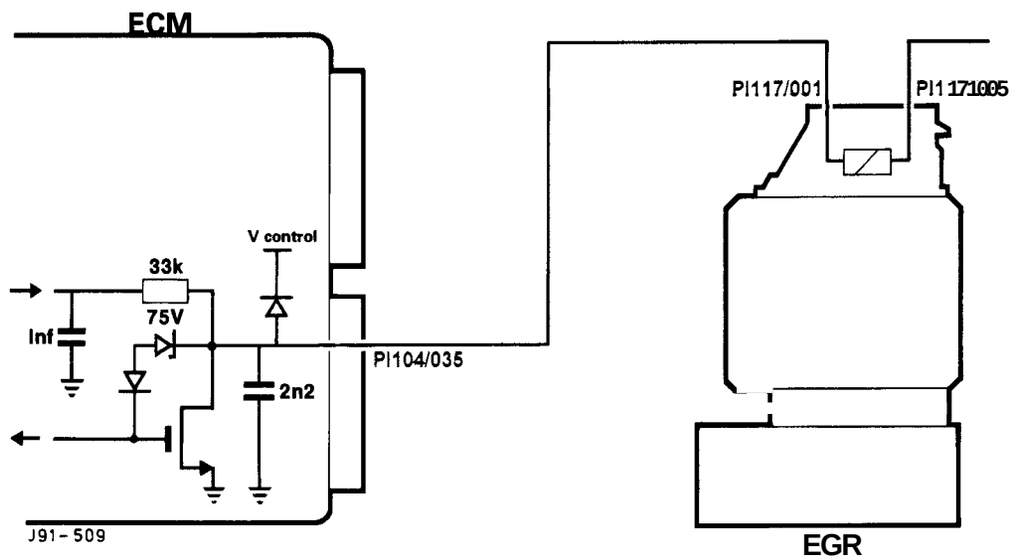


Fig. 2 Interface between **ECM & EGR** (low power)

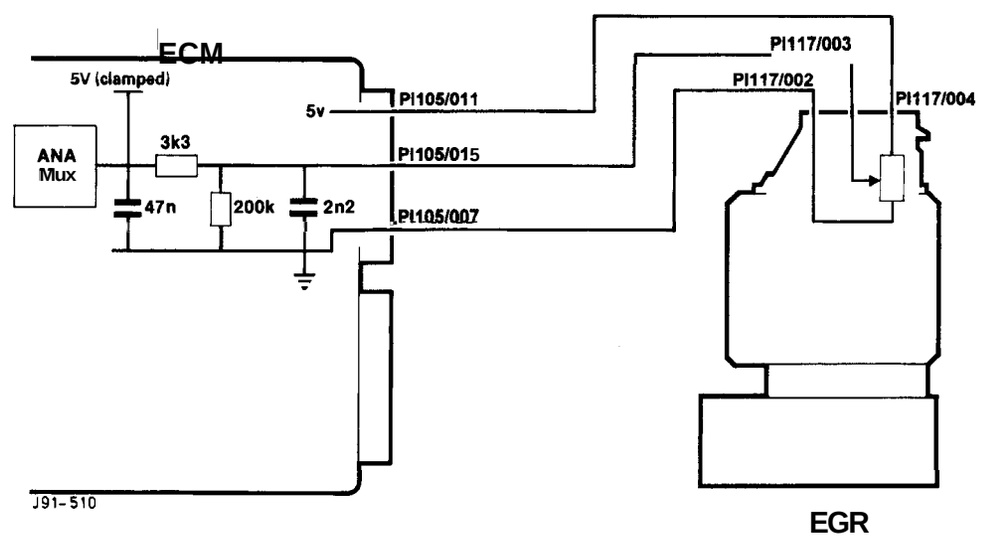


Fig. 3 Interface between **ECM & EGR** (high power)

EGR Flow or Function Sensor Open Circuit — *P 0400*

The EGR temperature is monitored when the following conditions are met; engine speed and load are within limits, coolant and air temperatures are above their threshold figures and the throttle position is below it's threshold setting. If the temperature, measured by the EGR thermistor, does not rise above a given setting within a time limit, on a number of occasions, then a fault is registered.

Possible causes of fault:

- EGR function sensor or harness open circuit
- Insufficient gas flowing in **EGR** circuit due to a leak
- EGR function sensor loose
- EGR function sensor contaminated or blocked
- Insufficient gas flowing due to a blocked pipe or valve
- **IAT,** TP or MAFS problem affecting test

EGR Valve Position Control — *P 7400*

The ECM monitors the difference between actual and demanded pintle valve position. If the pintle position error exceeds **10%** for a set time period, then a pintle valve position fault is registered.

5.1

Possible causes of fault:

- EGR pintle position sensor – incorrect voltage, partial short circuit or open circuit on sensor harness
- Obstruction in valve
- Valve seized
- ECM and ignition switch problem
- ECM to EGR drive stage problem
- ECM to EGR control fault

EGR Valve Position Circuit — *P 1401*

The pintle valve position sensor input is monitored to detect a high or low out–of–range value, continuously for a time period.

Signal range: 0 to 5 volts
Low out–of–range threshold: 0.37 volts
High out–of–range threshold: **4.80** volts

Possible causes of fault:

- EGR pintle sensor harness open circuit or short circuit to supply or ground
- EGR pintle sensor supply open circuit or short circuit to battery voltage or ground
- EGR pintle sensor ground open circuit or short circuit to supply
- EGR pintle sensor fault
- ECM interface circuit error

EGR Function Sensor — *P 1408*

EGR temperature is controlled to a maximum of 400°C. The function sensor output is checked for a high, out-of-range, temperature; when this occurs more than a given number of times then a fault is present.

Possible causes of fault:

- Harness short circuit to ground or supply
- EGR function sensor fault
- ECM interface circuit fault

The EGR function sensor output varies with temperature, as follows:

4.397V at 100°C.
3.696V at 200°C.
0.54V at 400°C.

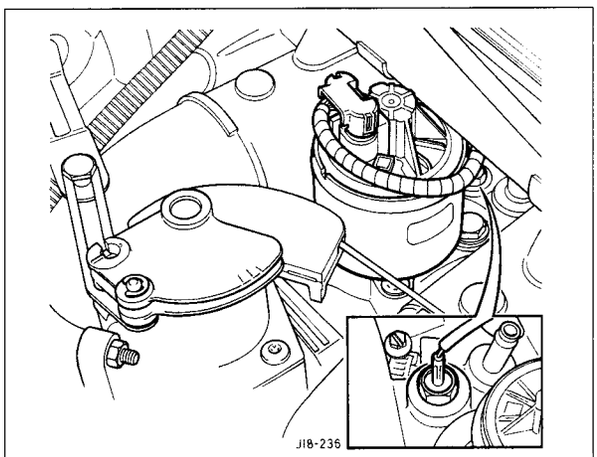


Fig. 1 EGR function sensor location

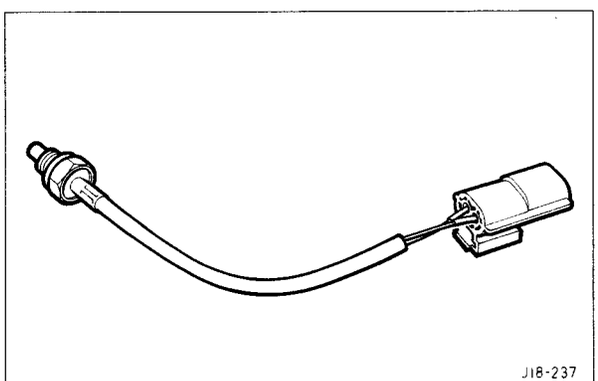


Fig. 2 EGR function sensor assembly

5.1

EGR Valve Circuit — *P 1409*

The ECM valve drive hardware will report open or short circuit faults directly.

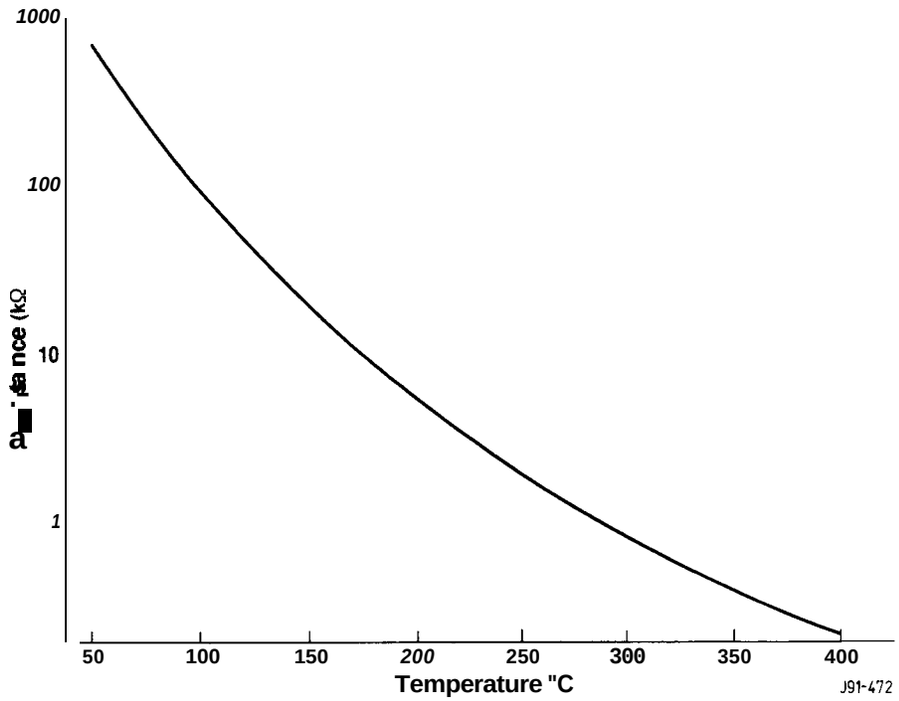
Possible causes:

- EGR drive harness open circuit or short circuit
- EGR drive solenoid fault open circuit or short circuit
- EGR driver fault

5.1

Additional Information

Figure 1 shows a graph of the EGR function sensor resistance with respect to temperature.



Fin. 1 Sensor resistance with respect to temperature

The voltage level for any temperature may be calculated by taking the following readings and substituting them into the formula. Figure 2 shows the test points.

Formula: $VT = \frac{RT \times 5V}{(1k8 + RT)}$

Examples:

20 °C	RT = 2M5	VT = 4.996V
50 °C	RT = 635K	VT = 4.994V
100 °C	RT = 85k3	VT = 4.397V
200 °C	RT = 5k10	VT = 3.696V
400 "C	RT = Ok22	VT = 0.540V

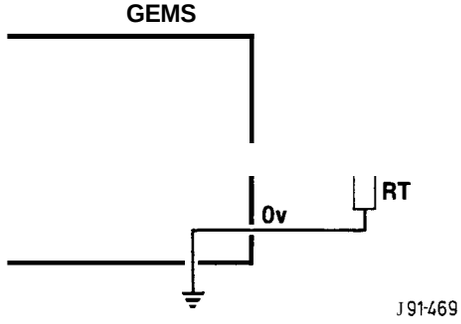


Fig. 2 Test points for calculation

EXHAUST GAS RECIRCULATION (EGR) VALVE - RENEW

SRO 17.45.01

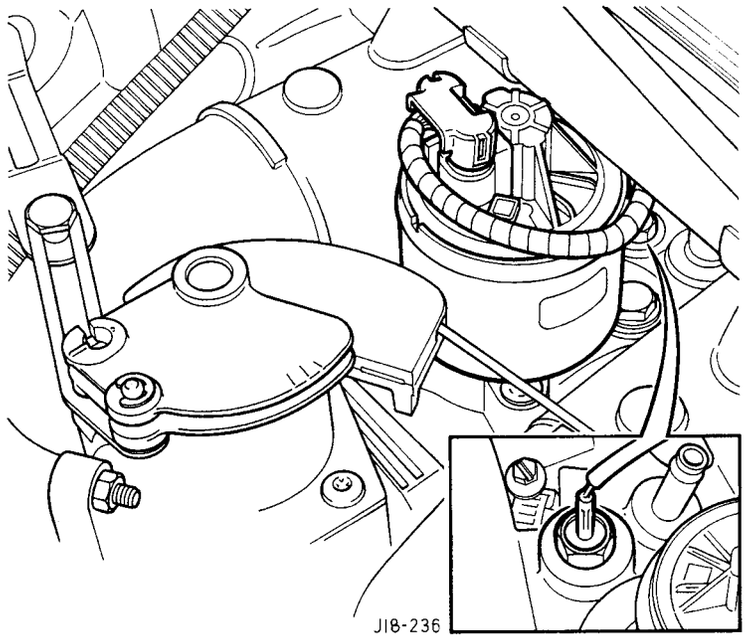


Fig. 1

The EGR valve is situated on the inlet manifold between the throttle body and the cylinder head.

- Open the hood and fit a wing cover.
- Open the trunk and remove the battery cover.
- Disconnect the battery ground lead.
- Disconnect the EGR valve harness multi-plug.
- Undo and remove the EGR valve securing bolts.
- Remove the EGR valve and valve gasket.
- Clean the valve mating faces.

Fitting a new EGR valve is the reverse of the removal procedure.

EXHAUST GAS RECIRCULATION (EGR) FUNCTION SENSOR - RENEW

SRO 17.45.08

- Open the hood and fit a wing cover.
- Open the trunk and remove the battery cover.
- Disconnect the battery ground lead.
- Release the EGR sensor multi-plug from the mounting bracket and disconnect the multi-plug.
- Undo and remove the EGR sensor.

Fitting a new EGR valve is the reverse of the removal procedure.

SECONDARY AIR INJECTION SYSTEM

Group 15

P 0411
P 0413
P 0414

Monitoring Procedure

The diagnostics for auxiliary air injection combine air flow and electrical circuit monitoring.

Air Flow Monitoring

In hot idle conditions, oxygen sensor feedback is used to detect the auxiliary air injected into the exhaust. If a change in the exhaust condition is detected then the test is passed, if not, a fault is present. There is no default strategy.

Electrical Circuit Monitoring

An open or short circuit fault in the Secondary Air Injection (AIR) pump drive relay circuit will be reported directly by the ECM hardware to the Diagnostic Status Manager DSM. The strategy will report to the DSMr when an AIR fault is present and the DSM will then decide whether to store a fault code and illuminate the MIL lamp.

The electric air pump is situated at the front left side of the engine.

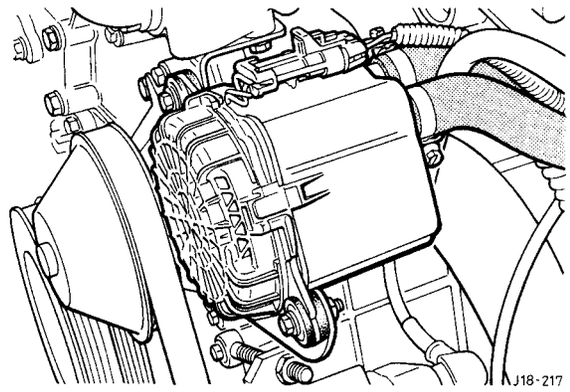


Fig. 1 Location of Air Pump

Description

The electric AIR pump is a regenerative turbine type which is permanently lubricated and requires no periodic maintenance. The pump draws air from the air cleaner and pumps it under pressure to the check valve mounted near the exhaust manifold; this check valve will prevent exhaust gas blowing back to the pump. Battery voltage to the AIR pump is supplied through the AIR pump relay which is controlled by the ECM. The pump has an integral, solenoid operated, stop valve which operates with the pump. When the pump is not operating the solenoid valve is at rest preventing air flow through the pump.

AIR pump operation is only possible when the coolant temperature is at or below 16°C. The system will run for 15 seconds at engine start-up or until the coolant reaches 16°C; the maximum pump running time is four minutes. The ECM checks the AIR system air flow using the electrical circuit and lambda feedback detecting additional air in the exhaust.

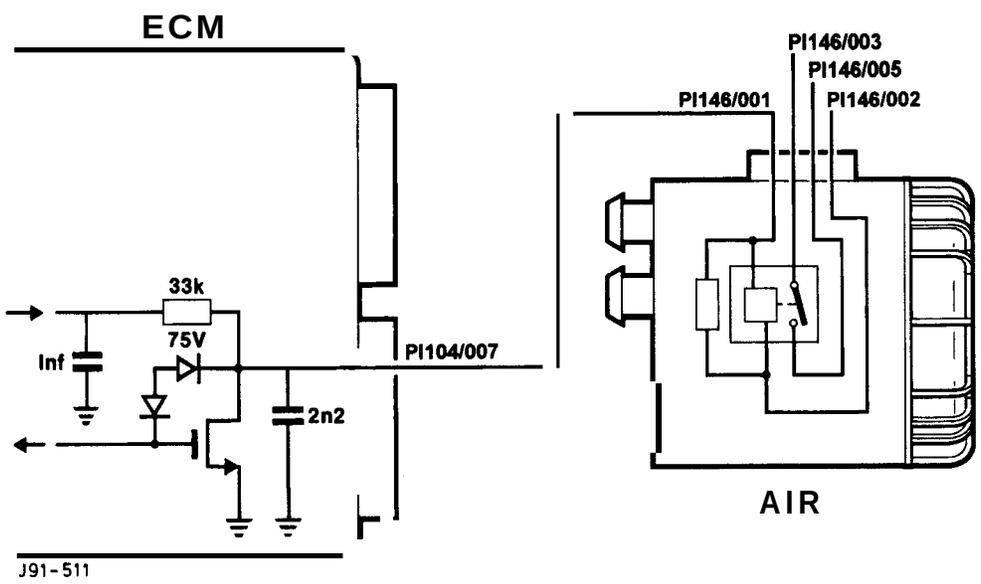


Fig. 2 Interface between ECM and AIR

AIR Insufficient Flow — *P 0411*

Possible causes:

- AIR pipe blocked
- AIR pipe ruptured
- AIR pump permanently off
- AIR pump fault
- AIR pump wiring fault (between pump and relay)
- AIR relay fault
- ECM fault – AIR relay fault

AIR Switching Valve Open Circuit — *P 0413*

Possible causes:

- AIR relay missing or open circuit
- AIR relay harness open circuit **or** short circuit to battery voltage
- ECM relay driver open circuit
- ECM fault

Air Switching Valve Short Circuit — *P 0414*

Possible causes:

- AIR relay short circuit
- AIR relay harness short circuit
- ECM relay driver short circuit
- ECM fault

Additional Information

Figure 1 shows a graph of airflow with respect to back pressure.

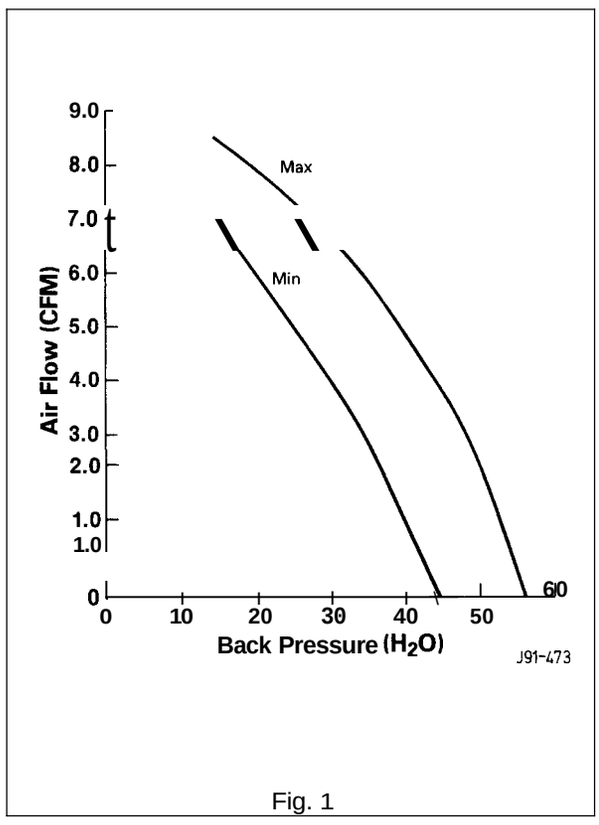


Fig. 1

AIR PUMP – RENEW

SRO ***17.25.07***

- Open the hood and fit a wing cover.
- Disconnect the air pump harness multi–plug.
- Slacken the air pump inlet and outlet hose securing clips and disconnect the hoses.
- Undo and remove the three air pump to mounting bracket securing bolts. Remove the air pump.
- Remove the air pump rubber mounts.

- Refitting the air pump is the reverse of the removal procedure.

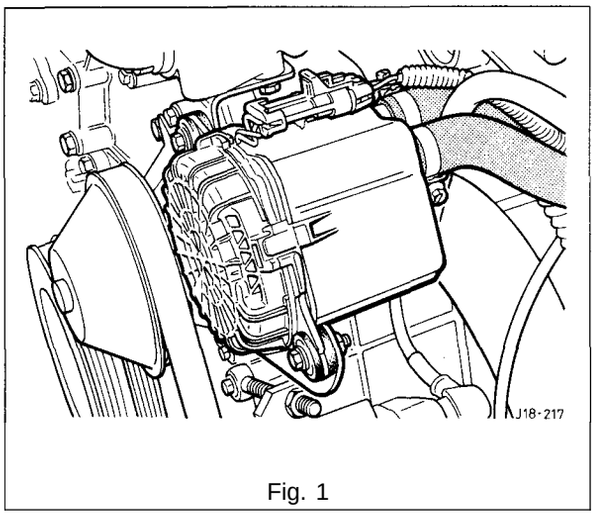


Fig. 1

5.1

CATALYST SYSTEM EFFICIENCY

Group 16

P 0420
P 0430

Monitoring Procedure

The condition of the catalyst is determined using the difference between the signals from the upstream and downstream oxygen sensors, and the time taken to switch from rich to lean. Vehicle conditions are checked for optimum conditions both before and during monitoring so that a steady state exists for successful catalyst monitoring to be achieved.

The strategy will report to the Diagnostic Status Manager (DSM) when a catalyst monitoring fault is present and the DSM will then decide whether to store a fault code and illuminate the MIL Lamp.

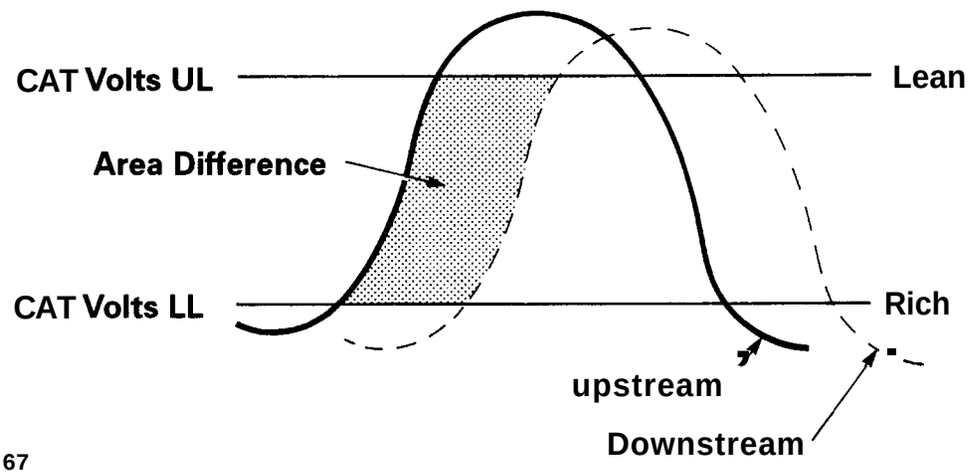


Fig. 1 Catalyst Characteristic

Catalyst Efficiency Low – Bank 1 ***P 0420***
Catalyst Efficiency Low – Bank 2 ***P 0430***

Possible causes:

- Catalyst fault – poor oxygen storage A,B
- Severe exhaust air leak A,B
- Slow response upstream oxygen sensor A,B
- Additional capacitance (upstream oxygen sensor) – harness fault A,B
- ECM filter wrong – oxygen sensor A,B
- Wrong load / speed sites – inlet air leak or air meter fault

EVAPORATIVE EMISSION CONTROL – EVAP

Group 17 ***P 0441***
P 0443

Monitoring Procedure

When a large fuelling correction is detected by the oxygen sensors during purging, the purge valve flow test is passed and no further action is taken. If the purge valve flow test is not passed, the purge valve is ramped open from the fully closed position when closed loop idle speed control is active. Any changes in lambda feedback correction and air by-pass valve position are monitored to detect the effect of the purge valve flow. A fault is confirmed if no effect is detected.

The strategy will report to the Diagnostic Status Manager (DSM) when an EVAP monitoring fault is present and the DSM will then decide whether to store a fault code and illuminate the MIL Lamp.

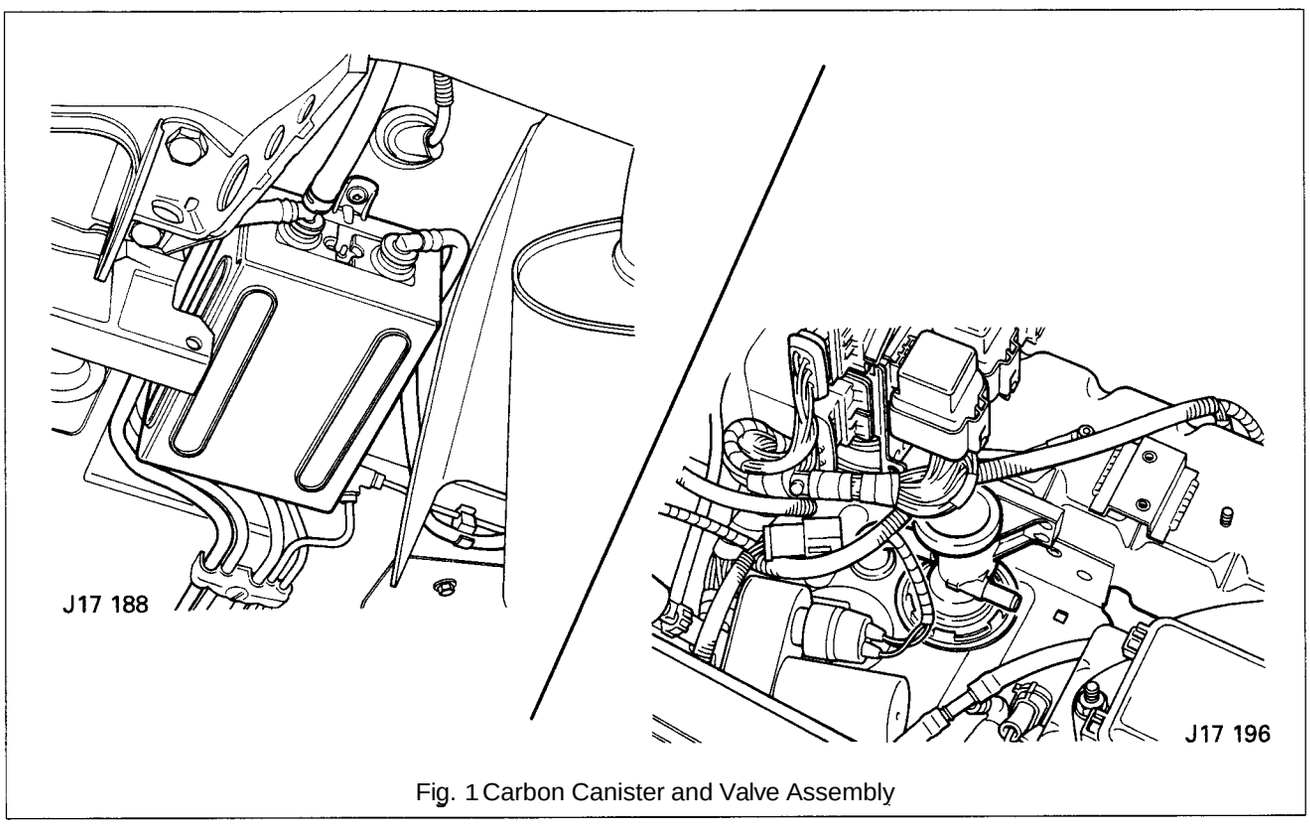


Fig. 1 Carbon Canister and Valve Assembly

The evaporative carbon canister is located on the LH side of the vehicle in front of the rear axle. North American vehicles; a secondary carbon canister is located on the RH side of the vehicle, opposite the primary carbon canister.

The purge valve is located below the LH headlamp module.

Evaporative Emission Control, (EVAP), limits the escape of fuel vapour from the fuel tank into the atmosphere. The fuel tank is capable of being filled to approximately 90% of its volume, the additional 10% is a volume of air which allows for expansion of the fuel without it escaping from the tank. The air above the fuel in the tank is charged with fuel vapour, which if the tank was allowed to vent to atmosphere, would escape as a pollutant.

In order to collect the vapour, the tank is vented through a canister (1 Fig. 1) packed with activated carbon. The fuel vapour is adsorbed onto the carbon and held there until the ECM commands the EVAP control valve (2 Fig. 1) to open and allow manifold depression to draw air through the carbon via the controlled entry port (3 Fig. 1). The flow of air through the carbon picks up vapour from the fuel which has been adsorbed by the carbon, so carrying the vapour to the inlet manifold (4 Fig. 1) to supplement the fuel injected, and be consumed.

When the engine is at rest the fuel tank is maintained at a positive pressure of 1.0 to 1.33 lb / in^2 by the pressure control valve (5 Fig. 1); pressure above this setting is released, by the valve, to the carbon canister. When the engine is running, the line (6 Fig. 1) from the inlet manifold to the pressure control valve is subject to manifold depression which activates the valve, so opening the line to the canister, allowing air drawn through the canister to replace the fuel withdrawn, to maintain atmospheric pressure in the fuel tank. If the pressure control valve is inoperative, over pressurisation of the fuel tank is prevented by the fuel filler cap having a pressure release setting of 2.0 to 2.5 lb / in^2.

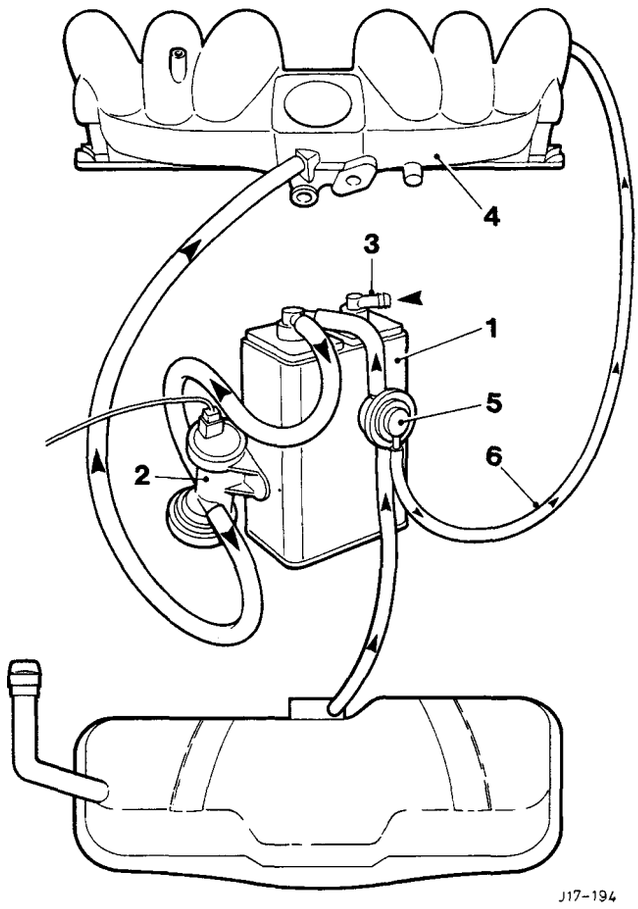


Fig. 1 EVAP Circuit

5.1

EVAP Purge Flow — *P 0441*

The purge valve is ramped open from the fully closed position during conditions when closed loop idle speed control is active. Changes in lambda feedback correction and air bypass valve position are monitored to detect the effect of the purge valve flow. A fault is confirmed if no effect is detected.

Possible causes:

- Purge valve fault – sticking
- Purge valve blocked
- Purge pipework blocked
- Purge to manifold pipe blocked or ruptured
- AIR pump stuck on – masks purge flow
- Auxiliary loads rise and fall to exactly match increase / decrease in purge flow
- Very low atmospheric pressure – insufficient to drive purge mixture through to engine

EVAP Purge Control Valve Circuit — *P 0443*

Possible causes:

- Purge valve connector open circuit
- Purge valve wiring open circuit or short circuit to ground or short circuit to battery voltage
- ECM fault – purge valve drive stage failed
- ECM fault – SOD fault

5.1

PURGE CONTROL VALVE – RENEW

SRO 17.15.30

- Open the hood and fit a wing cover.
- Displace and remove the fastener securing the air cleaner to front panel blanking cover. Remove the blanking cover.
- Release the air cleaner cover retaining clips. Remove the cover and the filter element.
- Displace and remove the filter cover from the inner wing grommet.
- Disconnect the purge valve connector.
- Release the clip securing the canister to purge valve hose. Disconnect the hose from the purge valve.
- Disconnect the elbow from the front of the purge valve.
- Undo and remove the purge valve mounting nuts.
- Displace and remove the purge valve from the mounting bracket.

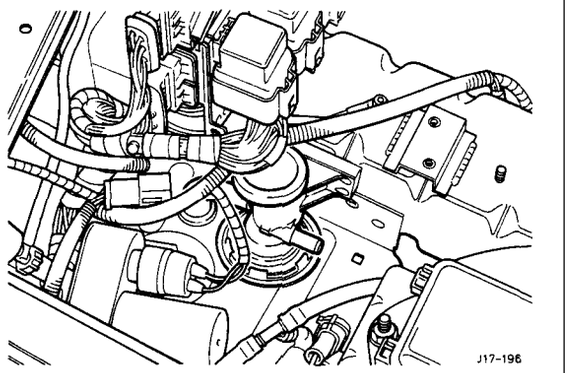


Fig. 1

- Refitting the purge valve is the reverse of the removal procedure.

VEHICLE SPEED SENSOR – VSS

Group 18 ***P 0500***

Monitoring Procedure

An engine load test will check for a sustained high engine load being present within a given range of engine speeds and a low road speed.
The tests will be different for manual and automatic transmission vehicles.
Electronic automatic transmission vehicles have a test using the transmission retard request signal; if these requests are being made at a low road speed then the test will fail.
No default strategy is applied to the road speed input.
If these tests are not passed then a fault event has occurred.
When sufficient fault events have occurred then a fault is registered.
The strategy will report to the Diagnostic Status Manager (DSM) when a **VSS** monitoring fault **is** present and the DSM will then decide whether to store a fault code and illuminate the MIL Lamp.

Vehicle Speed Sensor – VSS ***P 0500***

Possible causes:

- Transmission CM fault – sends ignition retard requests whilst stationary
- Road speed sensor fault
- Road speed signal pulled down by another consumer ECM
- Road speed signal swamped by Radio Frequency Interference (RFI)
- Road speed signal wrongly sent by another ECM
- ECM load signal is wrong high – but undetected

IDLE SPEED CONTROL – ISC

Group 19

P 0506
P 1507
P 1508
P 1509

Monitoring Procedure

Open and short circuit problems with the ISC stepper motor and wiring are detected by sampling the stepper motor coils fault status lines from the Serial Output Device. Stepper motor coils are checked for open circuit after referencing, during power down; the power to the stepper motor is not removed until after this test and if a given number of consecutive faults occur on any coil, an open circuit fault is present.

Both ends of the stepper motor coils are checked for short circuit during power down referencing and if a given number of fault events occur for any coil, then a short circuit fault is present.
The closed loop test monitors the cumulative opening and closing idle speed control steps, a fault being registered when the steps exceed the limits without causing a corresponding change in airflow rate.

If these tests are not passed then a fault event has occurred. When sufficient fault events have occurred then a fault is registered. The strategy will report to the Diagnostic Status Manager (DSM) when an ISC monitoring fault is present and the DSM will then decide whether to store a fault code and illuminates the MIL Lamp.

5.1

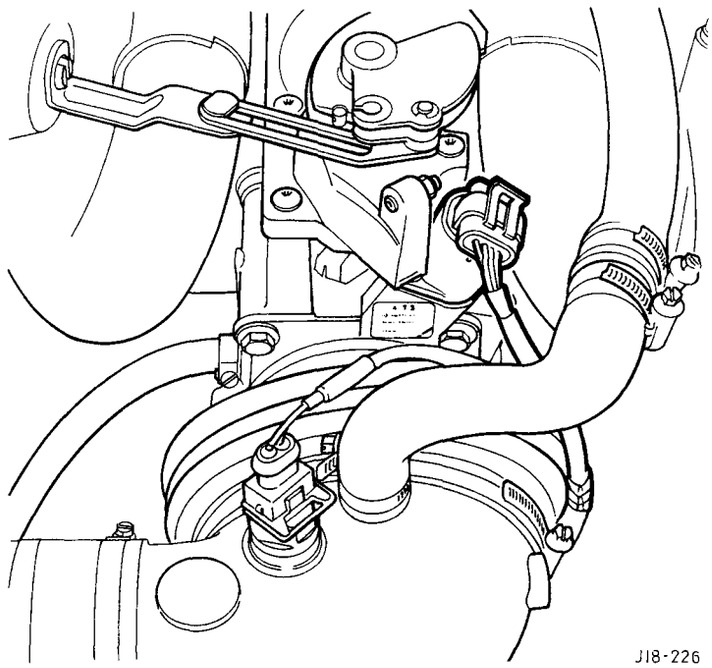


Fig. 1 Location of ISC

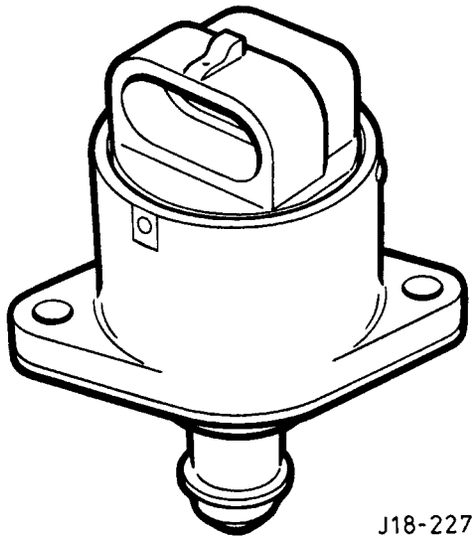


Fig. 1 idle Speed Control Valve

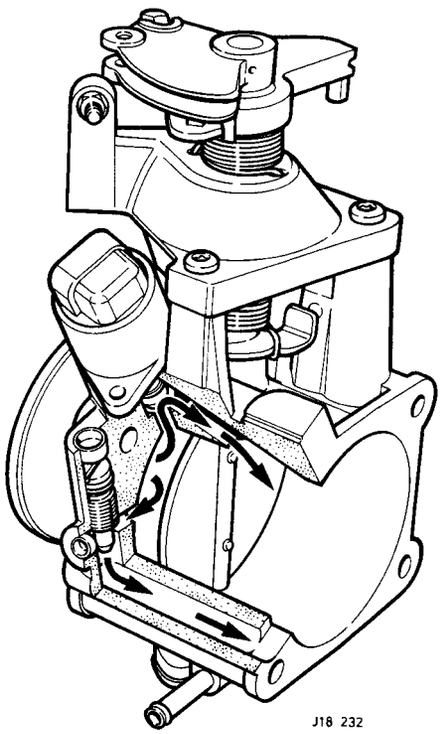


Fig. 2 Sectioned Throttle Body with ISCV

ISC RPM Low — *P 0506*

During closed loop control a test monitors the cumulative opening and closing ISC steps, a fault being logged when the cumulative steps applied in either direction exceed threshold values, without having caused a corresponding increase or decrease in airflow rate to beyond threshold values.

Threshold number of cumulative steps: **120**

Minimum coolant temperature for diagnostic to operate 79°C
Minimum engine speed for diagnostic to operate manual 485rpm
Minimum engine speed for diagnostic to operate auto 485rpm
Minimum engine speed for diagnostic to operate manual only 75%

Possible causes:

- ISC passages blocked
- ISC stepper motor jammed
- ISC stepper motor incorrectly mounted
- Air flow meter fault – output stuck
- ISC motor disconnected
- Engine not running properly – e.g. open throttle and still at idle

5.1

ISC RPM High — *P0507*

During closed loop control a test monitors the cumulative opening and closing ISC steps, a fault being logged when the cumulative steps applied in either direction exceed threshold values, without having caused a corresponding increase or decrease in airflow rate to beyond threshold values.

Possible causes:

- Base idle set too high
- ISC passages blocked
- ISC stepper motor jammed
- ISC stepper motor incorrectly mounted
- Airflow meter fault – output stuck
- **ISC** motor disconnected
- Air leak passed throttle

ISC Open Circuit — *P 1508*

Open and short circuit tests check for hardware failures by monitoring the stepper motor coils fault status lines.

The open circuit test checks for open circuit stepper motor coils during power–down, after ISC power–down referencing (which enables the ECM to align the valve to a reference opening). The power to the stepper motor is not removed until after this test. During a power–down, if a given number of consecutive fault events occur for any coil, then an ISC open circuit fault is present.

The short circuit test checks both ends of the stepper motor's coils during power down referencing. During a power down, if a given number of consecutive fault events occur for any coil, then an ISC short circuit fault is present.

Possible causes:

- ISC wiring open circuit in one or more wires
- ISC stepper motor fault – open circuit coil
- ECM fault – open circuit coil drive

ISC Short Circuit — *P 1509*

Open and short circuit tests check for hardware failures by monitoring the stepper motor coils fault status lines.

The open circuit test checks for open circuit stepper motor coils during power–down, after ISC power–down referencing (which enables the ECM to align the valve to a reference opening). The power to the stepper motor is not removed until after this test. During a power–down, if a given number of consecutive fault events occur for any coil, then an ISC open circuit fault is present.

The short circuit test checks both ends of the stepper motor coils during power down referencing. During a power–down, if a given number of consecutive fault events occur for any coil, then an ISC short circuit fault is present.

5.1.8 IDLE SPEED CONTROL VALVE/ GASKETS (NORMALLY ASPIRATED), RENEW

SRO 18.30.74 IDLE SPEED CONTROL VALVE

SRO 18.30.77 IDLE SPEED CONTROL VALVE GASKET

Remove

- Disconnect the battery ground lead.
- Remove the intake elbow to throttle housing hose.
- Disconnect idle speed control valve multi-plug.
- Disconnect throttle potentiometer multi-plug.
- Remove clevis pin circlip.
- Reposition link arm from quadrant.
- Disconnect kick-down cable (where fitted) from quadrant.
- Open throttle fully and disconnect inner cable from quadrant.
- Carefully release throttle against stop.
- Fit pipe clamps to throttle body heater feed and return hose.
- Disconnect feed hose from throttle body stub pipe.
- Remove throttle body assembly from inlet manifold.
- Remove idle speed control valve from throttle body.
- Remove gasket.
- Retrieve distance piece from throttle body recess.

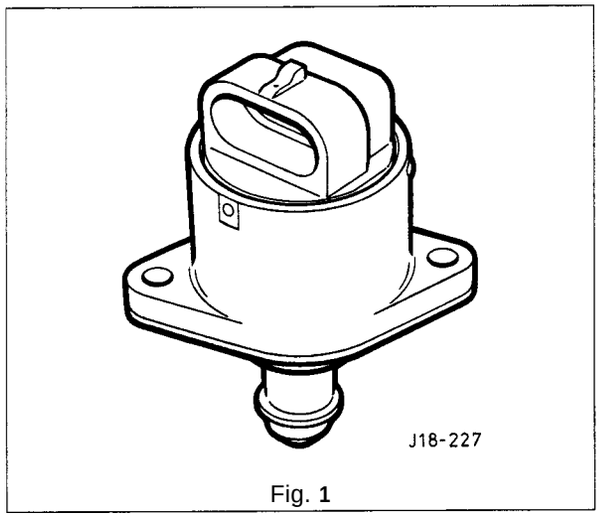


Fig. 1

Refit in the reverse order of the removal procedure.

PARK/ NEUTRAL POSITION SWITCH – PNPS

Group 20

P 1514

P 1516

P 1517

Monitoring Procedure

The PNPS is tested for incorrectly indicating neutral by detecting gear changes in electronic automatic transmission or high load conditions. The PNPS is tested for incorrectly indicating drive, by cranking. If these tests are not passed then a fault event has occurred. When sufficient fault events have occurred then a fault is registered.

The strategy will report to the Diagnostic Status Manager (DSM) when a PNPS monitoring fault is present and the DSM will then decide whether to store a fault code and to illuminate the MIL Lamp.

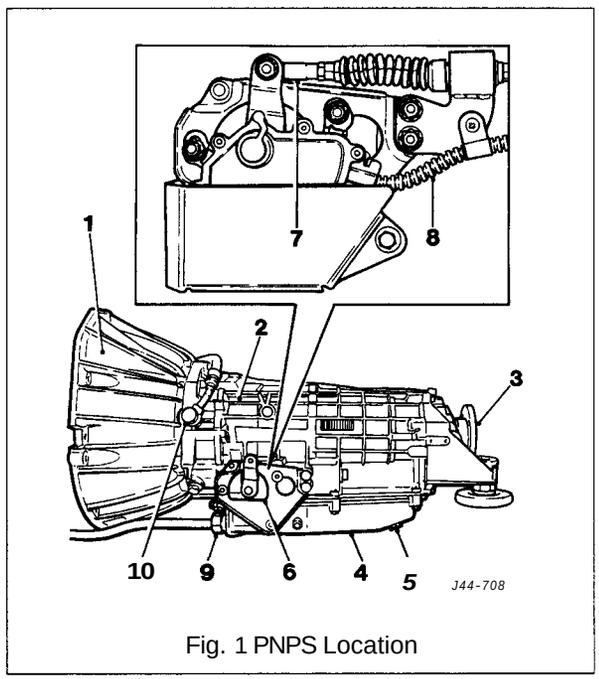


Fig. 1 PNPS Location

5.1

Three tests check the operation of the Neutral/ Drive switch.

- The Drive position test will check for engine conditions that indicate that the transmission is in Neutral while the switch indicates Drive.
- The high load test establishes that there is a false indication of Neutral from the Neutral/ Drive switch by checking for high engine load whenever high engine speed is seen in Neutral; high load indicates that the transmission is in Drive and low load implies Neutral.
- The gear change test on an electronically controlled automatic transmission involves monitoring for gear change requests while the switch indicates Neutral.

If these tests are not passed then the appropriate fault count will be incremented.

High Load Neutral / Drive

P 7514

Test checks whether the Neutral/ Drive switch is incorrectly indicating neutral, by detecting high engine load conditions or gear changes (on automatic transmission vehicles).
In neutral if engine load up to 47.8% and engine speed up to 1900 rpm then fault counter incremented.

Possible causes:

- ECM signal is wrong but undetected
- Neutral/ Drive switch falsely shows Neutral.
- Neutral / Drive wiring / connector short circuit to ground
- Neutral/ Drive wiring pulled low by other ECM

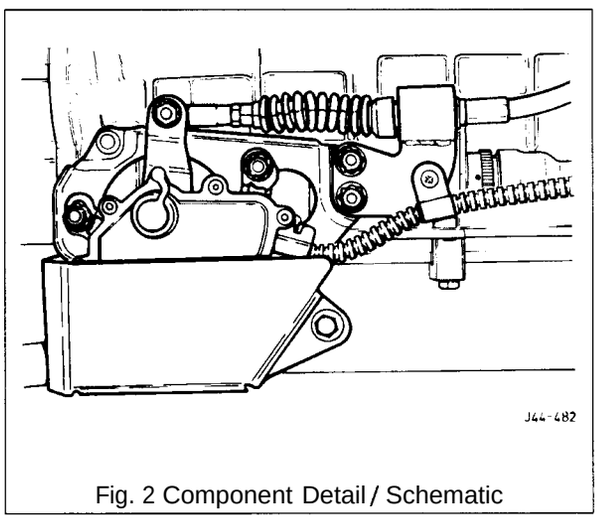


Fig. 2 Component Detail / Schematic

Gear Change Neutral / Drive *P 1516*

Test checks whether the Neutral / Drive switch is incorrectly indicating neutral, by detecting high engine load conditions or gear changes (on automatic transmission vehicles).
This test monitors for gear change request signals whilst the Neutral / Drive switch indicates neutral.

Possible causes:

- Neutral / Drive switch falsely shows N
- Neutral / Drive wiring / connector short circuit to ground
- Neutral / Drive wiring pulled low by other ECM
- Transmission ECM fault – sending extra ignition retard requests
- Road speed sensor fault – but undetected
- Road speed signal pulled down by another consumer ECM – but undetected
- Road speed signal swamped by Radio Frequency Interference (RFI) – but undetected
- Road speed signal wrongly sent by other ECM – but undetected

Cranking Neutral / Drive *P 1517*

A test checks for whether the Neutral / Drive switch is incorrectly indicating drive by detecting cranking.

Possible causes:

- Neutral / Drive switch falsely shows D
- Cranking inhibit not working with switch in D
- Neutral / Drive wiring /connector open circuit
- Neutral / Drive wiring pulled high by other ECM
- Neutral / Drive wiring /connector short circuit to voltage source
- ECM engine speed signal corrupted to look like cranking – Radio Frequency Interference (RFI)

ENGINE CONTROL MODULE (ECM)

Group 21 ***P 1607***
P 1621
P 1622

MIL Output Circuit ***P 1607***

A hardware test is carried out on the MIL Lamp by the ECM. The instrument pack'bulb–check' period, after the ignition is switched on, is used to drive the MIL Lamp 'on' and 'off' for a period of time. This allows the diagnosis of open and short circuit faults. Two successive trips within which the diagnostic indicates a fault will lead to a fault being stored.

Monitoring Procedure

The bulb check period, after the ignition has been switched on, is used by the MIL Lamp manager to drive the MIL Lamp both on and off, which allows the hardware to diagnose both open and short circuits.

The strategy will report to the Diagnostic Status Manager (DSM) when a MIL Lamp monitoring fault is present and the DSM will then decide whether to store a fault code and illuminate the MIL Lamp.

5.1

Possible causes:

- Wiring / connector fault in MIL Lamp harness
- Body computer to GEMS harness connector – open circuit or short circuit
- GEMS ECM hardware monitor faulty

ECM Engine Immobilisation Input Circuit Malfunction ***P 1621***

A range check on the diagnostic L–line is performed to check for voltages outside expected limits.

On detecting out of range voltages the appropriate fault code is stored and MIL lamp illuminated.

Engine Immobilisation Input Code Malfunction ***P 1622***

With the ignition 'on', and the security system 'disarmed' the security ECM transmits the appropriate authorisation code to the ECM. If the ECM receives two identical incorrect; or three different incorrect; authorisation codes from the security ECM; then this will be interpreted as an illegal attempt to start the vehicle.

On detection of an illegal attempt to start the vehicle, a fault code will be stored and the MIL Lamp illuminated.

CODES COMMON TO ECM AND TCM

Group 22 *P 0605*

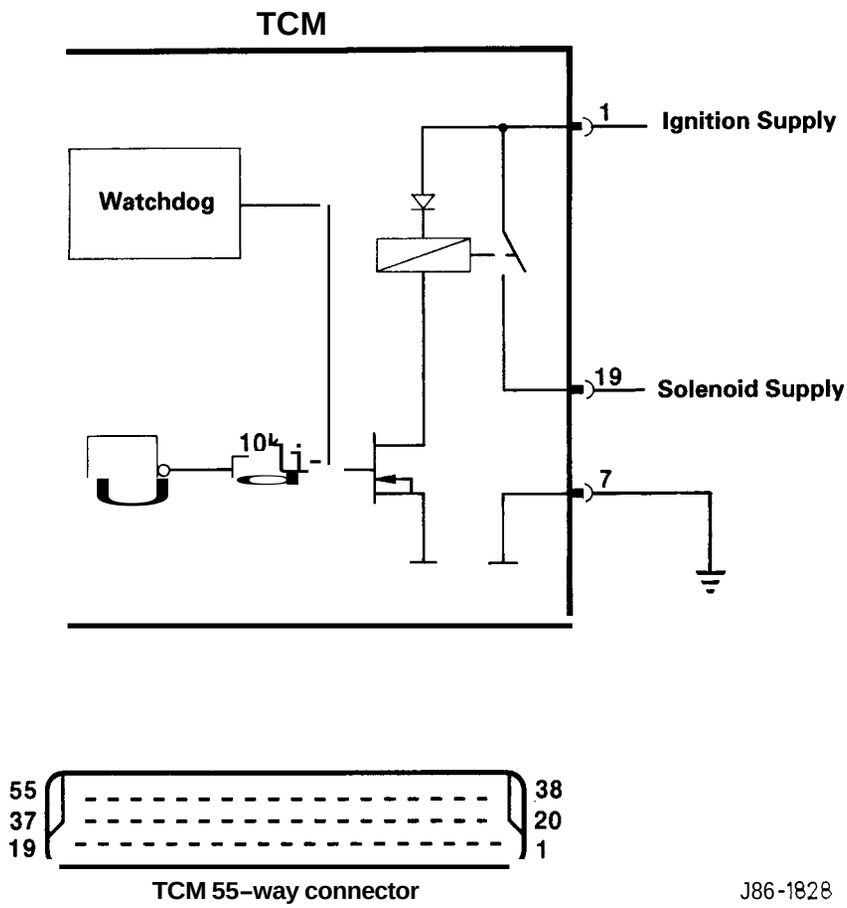


Fig. 1 Internal Relay Circuit Schematic

5.1

Internal Control Module ROM Test Error ***P 0605***

On each power–up, the ECM accesses its Electrically Erasable Programmable Read Only Memory (EEPROM)where it has stored DTC codes which have been flagged; freeze frame data logged at the time of those flaggings; and adaptive fuelling values. If a retrieved parameter does not correspond to what the ECM knows to being a 'sensible'value, then it will re–access that memory location up to two more times to try to obtain a such a value.

If a 'sensible' value for a parameter accessed from EEPROM is not received after three attempts then the fault code is stored and the MIL Lamp illuminated.

During initialization and operation the background diagnostics run a checksum on the data in the EEPROM. The checksum is performed on 20 bytes each programme cycle and the results are summed to achieve a complete checksum. If a fault is already logged then a complete checksum will be performed during initialization. When a checksum error is detected, the TCM will adopt the default function and store this fault code.

If this fault is permanently flagged, then the TCM should be replaced taking care to obtain the correctly programmed variant.

TRANSMISSION

Group 23

P 1775
P 1776
P 1777
P 1794

5.1

A Road Speed Sensor
B Pressure Regulator
D **Oil** Temperature Signal
F Road Speed Sensor
H MV1 Solenoid
J Oil Temperature Ground
K MV2 Solenoid
L MVWK Solenoid
M Solenoid Supply

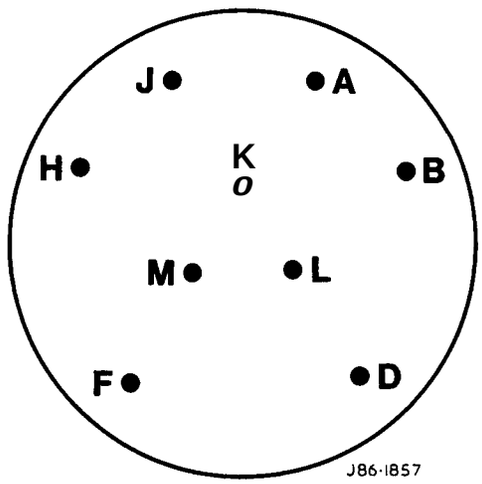


Fig. **1** Transmission Connector (GB003)

The solenoid valves are located on the valve block in the transmission assembly and can be identified by their position. Connection is made via a connector located on the LHS of the transmission assembly.

Resistance Checks Between Connector Contacts

28 to 60 ohm: M to L, M to K, **M** to H
33 to 67 ohm: L to B, K to B, H to **B**
56 to 120 ohm: L to K, **L** to H, K to H

5 to 7 ohm M to B

Open circuit: the combination of any one contact from each row **M K** L H B **A** D F J

Transmission MIL — *P 1775*

Monitoring Procedure

The ignition retard request line, from the TCM to the ECM, indicates when an emission-related fault is present in the automatic transmission.

The strategy will report to the Diagnostic Status Manager (DSM) when a MIL Lamp monitoring fault is present and the DSM will then decide whether to store a fault code and illuminate the MIL Lamp.

Possible causes:

- Transmission ECM sent MIL Lamp request
- Possible wrong Pulse Width Modulation (PWM) message received

Ignition Retard Request Duration — *P 1776*

Monitoring Procedure

If the ignition retard request line indicates a request for longer than the time limit, then there is a fault.
The strategy will report to the Diagnostic Status Manager (DSM) when a MIL Lamp monitoring fault is present and the DSM will then decide whether to store a fault code and illuminate the MIL Lamp.

Possible causes:

- Transmission ECM fault - retard request for too long
- Driver repeatedly requests shifts which require repeated ignition retard requests may not be possible

Ignition Retard Request Circuit — *P 1777*

Monitoring Procedure

The status of the TCM ignition retard request line is tested for hardware fault events. There is no automatic transmission default strategy so all faults that require such a strategy will be administered by the TCM.

The strategy will report to the Diagnostic Status Manager (DSM) when a MIL Lamp monitoring fault is present and the DSM will then decide whether to store a fault code and illuminate the MIL Lamp.

Possible causes:

- Transmission ECM error - sends invalid Pulse Width Modulation (PWM)
- Transmission ECM to GEMS harness connector open circuit
- Transmission ECM to GEMS harness connector short circuit to ground
- Transmission ECM to GEMS harness connector short circuit to battery voltage

System Voltage — *P 1794*

The TCM monitors the supply voltage and will log this fault if the voltage is less than 10.5V when the engine speed is greater than 1600rpm. This fault code is unlikely to be caused by a fault within the TCM and as such the vehicle harness and fuses etc. should be completely tested before the TCM is condemned.

Possible causes:

- Battery capacity low.
- Faulty fuse.
- Fault in harness.

MASS AIR FLOW SENSOR - P0101

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
		correct proceed to pinpoint test A7
		Check for inlet air leak, if found rectify and proceed to pinpoint test A7
		Check for inlet / exhaust blockage, if found rectify and proceed to pinpoint test A7
		Check harness and connector condition / integrity with ignition off if faulty rectify and proceed to pinpoint test **A7**
		If faults not found, proceed to pinpoint test A I

Pinpoint Tests

TEST STEP		RESULT	ACTION
A I	Check harness continuity PI 116/002 to ECM pin PI 105/004	OK	Proceed to A2
		Open Circuit	Locate and rectify wiring fault, re-connect harness and proceed to A7
A2	Check harness continuity PI 116/003 to ECM pin PI 105/029	OK	Proceed to A3
		Open Circuit	Locate and rectify wiring fault, re-connect harness and proceed to A7
A3	Check harness insulation PI 116/002 to ground	OK	Proceed to A4
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A7
A4	Check 12V +ve supply to PI 116/001 and continuity PI 116/003 to ground	OK	Proceed to A5
		Incorrect	Locate and rectify wiring fault, re-connect harness and proceed to A7
A5	Check throttle position read PID 11h	OK	Proceed to A6
		Incorrect	Re-calibrate throttle and proceed to A7
A6	Check MAFS	OK	Proceed to A7
		Incorrect	Repair or renew MAFS, re-connect harness and proceed to A7
A7	Clear fault code and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A8
A8	Return to Symptom Chart and repeat diagnostic procedure	OK	Stop
		Fault still present	Contact Jaguar Service Hotline

MASS AIR FLOW SENSOR – P0102

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0102	MAFS Low Input fault	Check fault run engine – read PID 10h, if correct proceed to-pinpoint test A6
		Check for inlet / exhaust blockage, if found rectify and proceed to pinpoint test A6
		Check harness and connector condition / integrity with ignition off, if faulty rectify and proceed to pinpoint test A6
		If faults not found, proceed to pinpoint test A I

Pinpoint Tests

TEST STEP		RESULT	ACTION
A1	Check harness continuity PI 116/002 to ECM pin PI 105/004	OK	Proceed to A2
		Open Circuit	Locate and rectify wiring fault, reconnect harness and proceed to A6
A2	Check harness continuity PI 116/003 to ECM pin PI 105/029	OK	Proceed to A3
		Open Circuit	Locate and rectify wiring fault, reconnect harness and proceed to A6
A3	Check harness insulation PI 116/002 to ground	OK	Proceed to A4
		Short circuit	Locate and rectify wiring fault, reconnect harness and proceed to A6
A4	Check 12V +ve supply to PI 116/001 and continuity PI 116/003 to ground	OK	Proceed to A5
		Incorrect	Locate and rectify wiring fault, reconnect harness and proceed to A6
A5	Check MAFS	OK	Proceed to A6
		Incorrect	Repair or renew MAFS, re-connect harness and proceed to A6
A6	Clear fault code and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A7
A7	Return to Symptom Chart and repeat diagnostic procedure	OK	Stop
		Fault still present	Contact Jaguar Service Hotline

5.1

CONDITION	POSSIBLE SOURCE	
Fault code P0103	MAFS High Input fault	

Pinpoint Tests

TEST STEP		RESULT	ACTION
A I	Check harness continuity PI 1161003 to chassis ground	OK	Proceed to A2
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A3
A2	Check MAFS	OK	Clear fault code and proceed to A3
		Incorrect	Repair or renew MAFS, re-connect harness and proceed to A3
A3	Perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A4
A4	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

CONDITION	POSSIBLE SOURCE	ACTION
Fault code **PO112** Fault code **PO113**	**IAT** Low Input fault **IAT** High Input fault	Read PID 0Fh – check in range, if correct proceed to pinpoint test **A4**
		Check harness and connector condition ▮ integrity with ignition off, if faulty rectify and proceed to pinpoint test **A4**
		If fault not found, disconnect **IAT** and proceed to pinpoint test **A1**

	TEST STEP	RESULT	ACTION
A1	Check harness continuity Pl **1051030** to Pl **1061002**	OK	Proceed to **A2**
		Open Circuit	Locate and rectify wiring fault, reconnect harness and proceed to **A4**
A2	Check harness continuity Pl **1061001** to Pl **105/001**	**OK**	Proceed to **A3**
		Open Circuit	Locate and rectify wiring fault, reconnect harness and proceed to **A4**
A3	Check sensor resistance within limits	Yes	Clear fault code and proceed to **A4**
		No	Fit new **IAT** sensor, re-connect harness and proceed to **A4**
A4	Perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to **A5**
A5	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

ENGINE COOLANT TEMPERATURE SENSOR – P0116

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0116	ECT Range / Performance fault	Turn ignition off
		Check harness and connector condition / integrity with ignition off, if faulty rectify and proceed to pinpoint test **A2**
		If fault not found, proceed to pinpoint test **A1**

Pinpoint Tests

TEST STEP	RESULT	ACTION
Remove thermostat to check operation	OK	Proceed to **A2**
	Incorrect	Fit new thermostat and proceed to **A2**
Perform service drive cycle to verify fault cleared	OK	stop
	Fault still present	Proceed to **A3**
Return to Symptom Chart and repeat diagnostic procedure	OK	stop
	Fault still present	Contact Jaguar Service Hotline

5.1

CONDITION	POSSIBLE SOURCE	ACTION
		Read PID **05H** – check in range, if correct proceed to pinpoint test **A4**
		Check harness and connector condition / integrity with ignition off, if faulty rectify and proceed to pinpoint test **A4**
		If fault not found, disconnect ECT sensor and proceed to pinpoint test **AI**

	TEST STEP	RESULT	ACTION
A I	Check harness continuity PI **1051031** to PI **1071002**	OK	Proceed to **A2**
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to **A4**
A2	Check harness continuity PI **107/001** to PI 105/0**14**	OK	Proceed to **A3**
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to **A4**
A3	Check sensor resistance within limits	OK	Proceed to **A4**
		incorrect	Renew sensor, reconnect harness and proceed to **A4**
A4	Clear fault code and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to **A5**
A5	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

5.1

ENGINE COOLANT TEMPERATURE SENSOR – P0118

Symptom Chart

CONDITION	POSSIBLE SOURCE	

Pinpoint Tests

		RESULT	ACTION
A1	Check harness continuity PI 105/031 to PI 107/002	**OK**	Proceed to A2
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A4
A2	Check harness continuity PI 107/001 **to** PI 105/014	**OK**	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A4
A3	Check sensor resistance within limits	**OK**	Proceed to A4
		Incorrect	Renew sensor, re-connect harness and proceed to A4
A4	Clear fault code and perform service drive cycle to verify fault cleared	**OK**	stop
		Fault still present	Proceed to A5
A5	Return to Symptom Chart and repeat diagnostic procedure	**OK**	stop
		Fault still present	Contact Jaguar Service Hotline

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0125	ECT Excessive Time to Enter Closed Loop Fuel Control	Check harness and connector condition / integrity with ignition off, if faulty rectify and proceed to pinpoint test A2
		If fault not found, remove thermostat and proceed to pinpoint test A I

TEST STEP		RESULT	ACTION
A I	Remove thermostat to check operation	OK	Proceed to A2
		Incorrect	Fit new thermostat and proceed to A2
A2	Perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Contact Jaguar Service Hotline
A3	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

5.1

THROTTLE POSITION – P0121

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0121	TP Range/ Performance Fault	Read PID 11H – check values correct when throttle is held fully open /closed, if correct proceed to pinpoint test A8
		Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A8
		If fault not found, disconnect TP sensor, switch on ignition and proceed to pinpoint test A I

Pinpoint Tests

TEST STEP		RESULT	ACTION
A I	Check 5V +ve at pin PI118/003 and OV at pin PI118/001	OK	Switch off ignition and proceed to A2
		Incorrect	Locate and rectify wiring fault, re–connect harness and proceed to A8
A2	Check harness continuity PI 118/003 to PI 105/011	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A8
A3	Check harness continuity PI 118/002 to PI 105/012	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A8
A4	Check harness continuity PI 118/001 to PI 105/007	OK	Proceed to A5
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A8
A5	Check harness insulation PI 118/002 to PI 118/001	OK	Proceed to A6
		Short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A8
A6	Connect multi–meter between TP terminals 1 and 2. Move wiper arm slowly through its range checking for smooth response in meter resistance reading.	OK	Proceed to A7
		Incorrect	Repair or renew TP sensor, re–connect harness and proceed to A8
A7	Check for inlet/ exhaust blockage	Clear	Fit new TP sensor, re-connect harness and proceed to A8
		Blocked	Clear blockage and proceed to A8
A8	Clear fault code and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Contact Jaguar Service Hotline
A9	Return to Symptom Chart and repeat diagnostic procedure	OK	Stop

THROTTLE POSITION – P0122

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0122	TP Low Input Fault	Read PID 11H – check values correct when throttle is held fully open / closed, if correct proceed to pinpoint test **A8**
		Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test **A8**
		If fault not found, disconnect TP sensor, switch on ignition and proceed to pinpoint test **A I**

Pinpoint Tests

5.1

TEST STEP		RESULT	ACTION
A I	Check 5V +ve at pin PI 118/003 and 0V at pin PI 118/001	OK	Switch off ignition and proceed to A2
		Incorrect	Locate and rectify wiring fault, re–connect harness and proceed to A8
A2	Check harness continuity PI 118/003 to PI 105/011	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A8
A3	Check harness continuity PI 118/002 to PI 105/012	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A8
A4	Check harness continuity PI 118/001 to PI **105/007**	OK	Proceed to A5
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A8
A5	Check harness insulation PI 118/002 to PI 118/001	OK	Proceed to A6
		Short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A8
A6	Connect multi–meter between TP terminals 1 and 2. Move wiper arm slowly through its range checking for smooth response in meter resistance reading.	OK	Proceed to A7
		Incorrect	Repair or renew TP sensor, re–connect harness and proceed to A8
A7	Check for inlet / exhaust blockage	Clear	Fit new TP sensor, re-connect harness, clear fault code and proceed *to* **A8**
		Blocked	Clear blockage and proceed to **A8**
A8	Perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to **A9**
A9	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

THROTTLE POSITION – P0123

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0123	TP High Input Fault	Read PID 11H – check values correct when throttle is held fully open / closed, if correct proceed to pinpoint test A8
		Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A8
		If fault not found, disconnect TP sensor, switch on ignition and proceed to pinpoint test A I

Pinpoint Tests

	TEST STEP	RESULT	ACTION
A I	Check 5V +ve at pin PI 118/003 and OV at pin PI 118/001	OK	Switch off ignition and proceed to A2
		Incorrect	Locate and rectify wiring fault, re-connect harness and proceed to A8
A2	Check harness continuity PI 118/003 to PI 105/011	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A8
A3	Check harness continuity PI 118/002 to PI 105/012	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A8
A4	Check harness continuity PI 118/001 to PI 105/007	OK	Proceed to A5
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A8
A5	Check harness insulation PI 118/002 to PI 118/001	OK	Proceed to A6
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A8
A6	Connect multi-meter between TP terminals 1 and 2. Move wiper arm slowly through its range checking for smooth response in meter resistance reading.	OK	Proceed to A7
		Incorrect	Repair or renew TP sensor, re-connect sensor and proceed to A8
A7	Check for inlet / exhaust blockage	Clear	Fit new TP sensor, re-connect harness, clear fault code and proceed to A8
		Blocked	Clear blockage and proceed to A8
48	Perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A9
49	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

HEATED OXYGEN SENSORS– P0131 / P0151

Note: Due to software configuration it is necessary to test both upstream sensors during fault diagnosis. Ensure that sensors are re-connected correctly to avoid further engine management problems.

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0131 / P0151	HO2S Low Voltage Fault (upstream sensor)	Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A6
		If fault not found, disconnect both upstream sensors and proceed to pinpoint test A I

Pinpoint Tests

	TEST STEP	RESULT	ACTION
	Note: Do not attempt to test resistance between sensor pins 3 and 4 as the current generated by a multimeter may damage the platinum electrodes		
A1	Check harness continuity PI 128/002 to PI 105/006	OK	Proceed to A2
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A6
A2	Check harness continuity PI 128/001 to PI 105/008	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A6
A3	Check harness continuity PI 129/002 to PI 105/019	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A6
A4	Check harness continuity PI 129/001 to PI 105/008	OK	Proceed to A5
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A6
A5	Renew and re–connect sensors if continuity checks OK	OK	Proceed to A6
A6	Perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A7
A7	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

HEATED OXYGEN SENSORS – P0132 / P0152

Note: Due to software configuration it is necessary to test both upstream sensors during fault diagnosis. Ensure that sensors are re–connected correctly to avoid further engine management problems.

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0132 / P0152	HO2S High Voltage Fault (upstream sensor)	Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A I 1
		If fault not found, disconnect both upstream sensors and proceed to pinpoint test A I

Pinpoint Tests

	TEST STEP	RESULT	ACTION
	Note: Do not attempt to test resistance between sensor pins 3 and 4 as the current generated by a multimeter may damage the platinum electrodes		
A I	Check harness continuity PI 128/002 to PI 105/006	OK	Proceed to A2
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A I I
A2	Check harness continuity PI 128/001 to PI 105/008	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A3	Check harness continuity PI 129/002 to PI 105/019	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A4	Check harness continuity PI 129/001 to PI 105/008	OK	Proceed to A5
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A5	Check harness insulation between signal wires and Vbatt	OK	Proceed to A6
		Short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A6	Check harness continuity PI 128/004 to RS006/008	OK	Proceed to A7
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A7	Check harness continuity PI 128/003 to PI 104/030	OK	Proceed to A8
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A8	Check harness continuity PI 129/004 to RS006/008	OK	Proceed to A9
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A9	Check harness continuity PI 129/003 to PI 104/030	OK	Proceed to A10
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A I I
A10	Renew and re–connect sensors if continuity checks OK	OK	Clear fault code and proceed to A I 1
A11	Perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A12
A12	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

HEATED OXYGEN SENSORS – P0133 / P0153

Note: Due to software configuration it is necessary to test both upstream sensors during fault diagnosis. Ensure that sensors are re-connected correctly to avoid further engine management problems.

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0133 / P0153	HO2S Slow Response Fault (upstream sensor)	Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A6
		If fault not found, disconnect both upstream sensors and proceed to pinpoint test A I

Pinpoint Tests

TEST STEP		RESULT	ACTION
A I	Check harness continuity PI 128/002 to PI 1051006	OK	Proceed to A2
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A6
A2	Check harness continuity PI 128/001 to PI 1051008	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A3	Check harness continuity PI 129/002 to PI 105/019	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A6
A4	Check harness continuity PI 129/001 to PI 105/008	OK	Proceed to A5
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A6
A5	Renew and reconnect sensors if continuity checks OK	OK	Proceed to A6
A6	Perform service drive cycle to verify fault cleared	OK	Stop
		Fault still present	Proceed to A7
A7	Return to Symptom Chart and repeat diagnostic procedure	OK	Stop
		Fault still present	Contact Jaguar Service Hotline

HEATED OXYGEN SENSORS – P0137 / P0157

Note: Due to software configuration it is necessary to test both downstream sensors during fault diagnosis. Ensure that sensors are re-connected correctly to avoid further engine management problems.

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0137 / P0157	HO2S Low Voltage Fault (downstream sensor)	Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A6
		If fault not found, disconnect both downstream sensors and proceed to pinpoint test A I

Pinpoint Tests

TEST STEP		RESULT	ACTION
	Note: Do not attempt to test resistance between sensor pins 3 and 4 as the current generated by a multimeter may damage the platinum electrodes		
A I	Check harness continuity PI 1261002 to PI 105/0 16	OK	Proceed to A2
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A2	Check harness continuity PI 1261001 to PI 1051008	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A3	Check harness continuity PI 127/002 to PI 105/0 18	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A4	Check harness continuity PI 1271001 to PI 1051008	OK	Proceed to A5
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A5	Renew and re-connect sensors if continuity checks OK	OK	Proceed to A6
A6	Perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A7
A7	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

5.1

HEATED OXYGEN SENSORS – P0138 / P0158

Note: Due to software configuration it is necessary to test both downstream sensors during fault diagnosis. Ensure that sensors are reconnected correctly to avoid further engine management problems.

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0138 / P0158	HO2S High Voltage Fault (downstream sensor)	Switch ignition ***off***
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A I 1
		If fault not found, disconnect both downstream sensors and proceed to pinpoint test A I

Pinpoint Tests

	TEST STEP	RESULT	ACTION
	Note: Do not attempt to test resistance between sensor pins 3 and 4 as the current generated by a multimeter may damage the platinum electrodes		
A I	Check harness continuity PI 126/002 to PI 105/016	OK	Proceed to A2
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A2	Check harness continuity PI 126/001 to PI 105/008	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A3	Check harness continuity PI 127/002 to PI 105/018	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A4	Check harness continuity PI 127/001 to PI 1051008	OK	Proceed to A5
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A5	Check harness insulation between signal wires and Vbatt	OK	Proceed to A6
		Short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A6	Check harness continuity PI 126/004 to RS006/008	OK	Proceed to A7
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A7	Check harness continuity PI 126/003 to PI 104/004	OK	Proceed to A8
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A8	Check harness continuity PI 127/004 to RS006/008	OK	Proceed to A9
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A9	Check harness continuity PI 127/003 to PI 104/004	OK	Proceed to A10
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A10	Renew and re–connect sensors if continuity checks OK	OK	Clear fault code and proceed to A11
A11	Perform service drive cycle to verify fault cleared	OK	Stop
		Fault still present	Proceed to A12
A12	Return to Symptom Chart and repeat diagnostic procedure	OK	Stop
		Fault still present	Contact Jaguar Service Hotline

Symptom Chart

CONDITION	POSSIBLE SOURCE	
Fault code P0139 / P0159	HO2S Slow Response Fault (downstream sensor)	

Pinpoint Tests

A1	Check harness continuity PI 126/002 to PI 105/016	OK	Proceed to A2
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A5
A2	Check harness continuity PI 126/001 to PI 105/008	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A5
A3	Check harness continuity PI 127/002 to PI 105/018	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A5
A4	Check harness continuity PI 127/001 to PI 105/008	OK	Fit new sensors, re-connect harness and proceed to A5
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A5
A5	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A6
A6	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

HEATED OXYGEN SENSORS – P1137 / P1157

Note: Due to software configuration it is necessary to test both downstream sensors during fault diagnosis. Ensure that sensors are reconnected correctly to avoid further engine management problems.

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1137 / P1157	HO2S Lack of Switching Indicates Lean Fuelling (downstream)	Check for exhaust air leaks, rectify pipework if faulty and proceed to pinpoint test A11
		Switch ignition off
		Check both downstream sensors are correctly fitted, if faulty rectify and proceed to pinpoint test A10
		If fault not found, disconnect both downstream sensors and proceed to pinpoint test A1

Pinpoint Tests

5.1

	TEST STEP	RESULT	ACTION
	Note: Do not attempt to test resistance between sensor pins 3 and 4 as the current generated by a multimeter may damage the platinum electrodes		
A1	Check sensors are connected to correct plugs	OK	Proceed to A2
		Incorrect	Rectify and proceed to A10
A2	Check harness continuity PI 126/002 to PI 105/016	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A10
A3	Check harness continuity PI 126/001 to PI 105/008	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A10
A4	Check harness continuity PI 127/002 to PI 105/018	OK	Proceed to A5
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A10
A5	Check harness continuity PI 127/001 to PI 105/008	OK	Proceed to A6
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A10
A6	Check each downstream sensor heater resistance is within limits of 5.3 – 6.7Ω	OK	Proceed to A7
		Out-of-range	Renew faulty element, re-connect harness and proceed to A10
A7	Check harness continuity PI 126/003 to PI 1271003	OK	Proceed to A8
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A10
A8	Check harness continuity PI 126/003 PI 105/004	**OK**	Proceed to A9
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A10
A9	Check harness continuity PI 1261004 and PI 1271004 to RS 0061008	OK	Fit new sensors, re-connect harness and proceed to A10
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A10
A10	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A11
A11	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1138/ P1158	HO2S Lack of Switching Indicates Rich Fuelling (downstream)	Switch ignition off and disconnect both downstream sensors and proceed to pinpoint test A I

Pinpoint Tests

TEST STEP		RESULT	ACTION
	Note: Do not attempt to test resistance between sensor pins 3 and 4 as the current generated by a multimeter may damage the platinum electrodes		
A I	Test insulation PI 126/002 and PI127/002 to ground	OK	Proceed to A2
		Short circuit	Locate and repair wiring fault and proceed to A4
A2	Check each downstream sensor heater resistance is within limits of 5.3 – 6.7Ω	OK	Proceed to A3
		Incorrect	Renew heater element, re-connect harness and proceed to A4
A3	Check sensors are connected to correct plugs	OK	Fit new sensors, re–connect harness and proceed to A4
		Incorrect	Rectify, re–connect harness and proceed to A4
A4	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A5
A5	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaauar Service Hotline

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0171 / P0174	System **too** Lean	Check for exhaust air leaks, rectify pipework if faulty and proceed to pinpoint test A10
		Check for misfire code recorded, if found rectify and proceed to pinpoint test A10
		Switch ignition off if fault not found and proceed to pinpoint test A I

	TEST STEP	RESULT	ACTION
A I	Check harness continuity PI 126/002 to PI 105/016	OK	Proceed to A2
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A10
A2	Check harness continuity PI 126/001 to PI 105/008	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A10
A3	Check harness continuity PI 127/002 to PI 105/018	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A10
A4	Check harness continuity PI 127/001 to PI 105/008	OK	Proceed to A5
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A10
A5	Check harness continuity PI 128/002 to PI 105/006	OK	Proceed to A6
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A10
A6	Check harness continuity PI 128/001 PI 105/008	OK	Proceed to A7
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A10
A7	Check harness continuity PI 129/001 to PI 105/019	OK	Reconnect sensors and proceed to A8
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A10
A8	Check harness continuity PI 129?001 to PI 105/008	OK	Proceed to A9
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A10
A9	Check injectors for blockages	Clear	Proceed to A10
		Blocked	Clear and proceed to A10
A10	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A I 1
A11	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

ADAPTIVE FUEL - P0172 / P0175

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0172 / P0175	System too Lean	Check for exhaust air leaks, rectify pipework if faulty and proceed to pinpoint test A6
		Check for misfire code recorded, if found rectify and proceed to pinpoint test A6
		Switch ignition off if fault not found, disconnect all HO2S sensors and proceed to *pinpoint* test A I

Pinpoint Tests

TEST STEP		RESULT	ACTION
A I	Check harness insulation PI 126/002 to ground	OK	Proceed to A2
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A2	Check harness insulation PI 127/002 to ground	OK	Proceed to A3
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A3	Check harness insulation PI 128/002 to ground	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A4	Check harness insulation PI 129/002 to ground	OK	Proceed to A5
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A5	Check injectors for leaks	OK	Proceed to A6
		Leaking	Repair and proceed to A6
A6	Clear fault and perform service drive cycle to verify fault cleared	OK	Stop
		Fault still present	Proceed to A7
A7	Return to Symptom Chart and repeat diagnostic procedure	OK	Stop
		Fault still present	Contact Jaguar Service Hotline

5.1

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1171	Lean Fuelling	Check fuel tank is not empty, if necessary fill tank and proceed to pinpoint test A14
		Check fuel pump is being driven, if faulty rectify and proceed to pinpoint test A14
		Remove fuel pump relay and harness connector from fuel pump if fault not found and proceed to pinpoint test A I

TEST STEP		RESULT	ACTION
A I	Check harness continuity BT 0261085 to PI 104/0 19	OK	Proceed to A2
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A14
A2	Check harness continuity BT 0261030 to BT 0351004	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A14
A3	Check harness continuity BT 0261086 to CA 0441007	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A14
A4	Check harness continuity BT 0261087 to BT 0061002	OK	Proceed to A5
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A14
A5	Check harness continuity BT 0061001 to ground	OK	Proceed to A6
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A14
A6	Check fuel pump relay operation	OK	Refit relay and proceed to A7
		Faulty	Repair or renew relay, re-connect harness and proceed to A14
A7	Check fuel filter for blockage	Clear	Proceed to A8
		Blocked	Clear and proceed to A14
A8	Check injectors for blockages	Clear	Proceed to A9
		Blocked	Clear and proceed to A14
A9	Check fuel pipe / rail for leaks / blockages	OK	Proceed to A I0
		Faulty	Rectify and proceed to A14
A10	Check fuel rail pressure	OK	Proceed to A I 1
		Too Low	Rectify and proceed to A14
A11	Check harness insulation injector pin harness connector to ground (for each injector)	OK	Proceed to A I2
		Full / partial short circuit	Locate and rectify wiring fault, reconnect harness and proceed to A14
A12	Check if MAFS or HO2S fault code is recorded	NO	Disconnect fuel pump from harness and proceed to A13
		Yes	Rectify fault and proceed to A14
A13	Check voltage is approximately 10V at BT 0061002	OK	Proceed to A I4
		Out-of-range	Rectify supply fault and proceed to A14
A14	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A15

TEST STEP		RESULT	ACTION
A15	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

ADAPTIVE FUEL – P1172

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1172	Rich Fuelling	Proceed to Pinpoint test A1

Pinpoint Tests

TEST STEP		RESULT	ACTION
A I	Check fuel rail pressure	OK	Proceed to A2
		Incorrect	Rectify and proceed to A7
A2	Check for blockages in fuel return pipe	**OK**	Proceed to A3
		Blocked	Clear and proceed to A7
A3	Check regulator vacuum pipe for leakage	OK	Proceed to A4
		Leaking	Repair or renew pipe and proceed to A7
A4	Check injectors for leaks	OK	Proceed to A5
		Leaking	Repair or renew injector, reconnect harness and proceed to A7
A5	Check if MAFS or HO2S fault code is recorded	NO	Disconnect fuel pump from harness and proceed to A6
		Yes	Rectify fault and proceed to A7
A6	Clear fault and perform service drive cycle **to** verify fault cleared	**OK**	stop
		Fault still present	Proceed to A7
A7	Return to Symptom Chart and repeat diagnostic procedure	**OK**	stop
		Fault still present	Contact Jaguar Service Hotline

5.1

ADAPTIVE FUEL - P1176

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1176	Lean Fuelling Trim, Long Term (MFR)	Check fuel pump is being driven, if faulty rectify and proceed to pinpoint test **A12**
		Remove fuel pump relay and harness connector from fuel pump if fault not found and proceed to pinpoint test **A1**

TEST STEP		RESULT	ACTION
A1	Check harness continuity BT **0261085** to PI **104/019**	OK	Proceed to **A2**
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to **A12**
A2	Check harness continuity BT **0261030** to BT **0351004**	OK	Proceed to **A3**
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to **A12**
A3	Check harness continuity BT **0261086** to **CA 0441007**	OK	Proceed to **A4**
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to **A12**
A4	Check harness continuity BT **0261087** to BT **0061002**	OK	Proceed to **A5**
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to **A12**
A5	Check harness continuity BT **0061001** to ground	OK	Refit fuel pump relay and proceed to **A6**
		Open circuit	Locate and rectify wiring fault, re-connect harness, refit fuel pump relay and proceed to **A12**
A6	Check fuel filter for blockage	Clear	Proceed to **A7**
		Blocked	Clear and proceed to **A12**
A7	Check fuel pipe ▮ rail for leaks ▮ blockages	OK	Proceed to **A8**
		Faulty	Rectify and proceed to **A12**
A8	Check fuel rail pressure	OK	Proceed to **A9**
		Too Low	Rectify and proceed to **A12**
A9	Check injectors for blockages	Clear	Proceed to **A10**
		Blocked	Clear and proceed to **A12**
A10	Check harness insulation injector pin harness connector to ground (for each injector)	OK	Proceed to **A11**
		Full ▮ partial short circuit	Locate and rectify wiring fault, re-connect harness and proceed to **A12**
A11	Check if MAFS or HO2S fault code is recorded	NO	Disconnect fuel pump from harness and proceed to **A12**
		Yes	Rectify fault and proceed to **A12**
A12	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to **A13**
A13	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

5.1

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1177	Rich Fuelling Trim, Long Term (FMFR)	Proceed to Pinpoint test A I

TEST STEP		RESULT	ACTION
A I	Check fuel rail pressure	OK	Proceed to A2
		Incorrect	Rectify and proceed to A6
A2	Check for blockages in fuel return pipe	OK	Proceed to A3
		Blocked	Clear and proceed to A6
A3	Check regulator vacuum pipe for leakage	OK	Proceed to A4
		Leaking	Repair or renew pipe and proceed to A6
A4	Check injectors for leaks	OK	Proceed to A5
		Leaking	Repair or renew injector, re-connect harness and proceed to A6
A5	Check if MAFS or HO2S fault code is recorded	NO	Disconnect fuel pump from harness and proceed to A6
		Yes	Rectify fault and proceed to A6
A6	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A7
A7	Return to Symptom Chart and repeat diagnostic procedure	OK	Stop
		Fault still present	Contact Jaguar Service Hotline

ADAPTIVE FUEL - P1178, P1179

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1178	Rich Fuelling Trim, Long Term (AMFR)	Check for manifold air leaks, rectify as necessary
		Check for recorded MAFS fault code, rectify as necessary
		Clear fault code and perform service drive cycle to verify fault cleared
		Contact Jaguar Service Hotline if fault still present

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1179	Rich Fuelling Trim, Long Term (AMFR)	Check for exhaust leaks, rectify as necessary
		Check for recorded MAFS fault code, rectify as necessary
		Clear fault code and perform service drive cycle to verify fault cleared
		Contact Jaguar Service Hotline if fault still present

HEATED OXYGEN SENSORS – P1185

Note: Due to software configuration it is necessary to test both upstream sensors during fault diagnosis. Ensure that sensors are re-connected correctly to avoid further engine management problems.

symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1185	HO2S Heater Open Circuit (upstream sensor)	Switch ignition off
		Check harness and connector condition ▮ integrity, if faulty rectify and proceed to pinpoint test A7
		If fault not found, disconnect both upstream sensors and proceed to pinpoint test A I

Pinpoint Tests

	TEST STEP	RESULT	ACTION
	Note: Do not attempt to test resistance between sensor pins 3 and 4 as the current generated by a multimeter may damage the platinum electrodes		
A I	Check each upstream sensor heater resistance is within limits of 5.3 – 6.7Ω	OK	Proceed to A2
		Out-of-limits	Renew sensor, reconnect harness and proceed to A7
A2	Check harness continuity PI 128/003 to PI 1291003	OK	Switch off ignition and proceed to A3
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A7
A3	Check harness continuity PI 1281001 to PI 104/030	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A7
A4	Check harness continuity PI 128/004 to RS 0061008	OK	Proceed to A5
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A7
A5	Check harness continuity PI 129/004 to RS 006/008	OK	Proceed to A6
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A7
A6	Check harness insulation PI128/003 to ground	OK	Reconnect harness and proceed to A7
		Short circuit	Locate and rectify wiring fault, reconnect harness and proceed to A7
A7	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A8
A8	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

HEATED OXYGEN SENSORS – P1186

Note: Due to software configuration it is necessary to test both upstream sensors during fault diagnosis. Ensure that sensors are re-connected correctly to avoid further engine management problems.

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1186	HO2S Heater Short Circuit (upstream sensor)	Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A3
		If fault not found, disconnect both upstream sensors and proceed to pinpoint test A1

Pinpoint Tests

	TEST STEP	RESULT	ACTION
	Note: Do not attempt to test resistance between sensor pins 3 and 4 as the current generated by a multimeter may damage the platinum electrodes		
A1	Check each upstream sensor heater resistance is within limits of 5.3 – 6.7Ω	OK	Proceed to A2
		Out-of-limits	Renew sensor, re-connect harness and proceed to A3
A2	Check voltage is reading 0 PI 128/003 and PI 1291003 to Vbatt	OV	Renew sensors, re-connect harness and proceed to A3
		Above OV	Locate and rectify wiring fault, re-connect harness, reconnect harness and proceed to A3
A3	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A4
A4	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

HEATED OXYGEN SENSORS – P1187

Note: Due to software configuration it is necessary to test both upstream sensors during fault diagnosis. Ensure that sensors are re-connected correctly to avoid further engine management problems.

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1187	HO2S Heater Inferred Open Circuit (upstream sensor)	Switch ignition off
		Check harness and connector condition ▌ integrity, if faulty rectify and proceed to pinpoint test A6
		If fault not found, disconnect both upstream sensors and proceed to pinpoint test A I

Pinpoint Tests

	TEST STEP	RESULT	ACTION
	Note: Do not attempt to test resistance between sensor pins 3 and 4 as the current generated by a multimeter may damage the platinum electrodes		
A I	Check each upstream sensor heater resistance is within limits of 5.3 – 6.7Ω	OK	Proceed to A2
		Out-of-limits	Renew sensor, reconnect harness and proceed to A6
A2	Check harness continuity PI 1261003 to PI 1271003	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A3	Check harness continuity PI 126/001 to PI 1041004	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A6
A4	Check harness continuity PI 126/004 to RS 0061008	OK	Proceed to A5
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A6
A5	Check harness continuity PI 127/004 to RS 006/008	OK	Renew sensors, re-connect harness and proceed to A6
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A6	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A7
A7	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

5.1

HEATED OXYGEN SENSORS – P1188

Note: Due to software configuration it is necessary to test both upstream sensors during fault diagnosis. Ensure that sensors are reconnected correctly to avoid further engine management problems.

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1188	HO2S Heater Resistance (upstream sensor)	Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A7
		If fault not found, disconnect both upstream sensors and proceed to pinpoint test A I

Pinpoint Tests

TEST STEP		RESULT	ACTION
	multimeter may damage the platinum electrodes		
A I	Check each upstream sensor heater resistance is within limits of 5.3 – 6.7Ω	OK	Proceed to A2
		Out-of-limits	Renew sensors, re-connect harness and proceed to A7
A2	Check harness continuity PI 128/003 to PI 129/003	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A7
A3	Check harness continuity PI 128/003 to PI 104/030	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A7
A4	Check harness continuity PI 128/004 to RS 006/008	OK	Proceed to A5
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A7
A5	Check harness continuity PI 1291004 to RS 0061008	OK	Proceed to A6
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A7
A6	Check harness insulation PI 128/003 to ground	OK	Renew sensors, re-connect harness and proceed to A7
		Short circuit	Locate and rectify wiring fault, re-connect harness, reconnect harness and proceed to A7
A7	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A8
A8	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1189	HO2S Heater Circuit Low Resistance (upstream sensor)	Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A7
		If fault not found, disconnect both upstream sensors and proceed to pinpoint test A I

	TEST STEP	RESULT	ACTION
	Note: **Do** not attempt to test resistance between sensor pins 3 and 4 as the current generated by a multimeter may damage the platinum electrodes		
A1	Check each upstream sensor heater resistance is within limits of 5.3 – 6.7Ω	OK	Proceed to A2
		Out–of–limits	Renew sensors, re-connect harness and proceed to A7
A2	Check harness continuity PI 1281003 **to** PI 1291003	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A7
A3	Check harness continuity PI 1281003 to PI 104/030	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A7
A4	Check harness continuity PI 1281004 to RS 0061008	OK	Proceed to A5
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A7
A6	Check harness continuity PI 1291004 to RS 0061008	OK	Renew sensors, re–connect harness and proceed to A7
		Open circuit	Locate and rectify wiring fault, re–connect harness, reconnect harness and proceed to A7
A7	Clear fault and perform service drive cycle to verify fault cleared	OK	**Stop**
		Fault still present	Proceed to A8
A8	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

HEATED OXYGEN SENSORS – P1190

Note: Due to software configuration it is necessary to test both upstream sensors during fault diagnosis. Ensure that sensors are re–connected correctly to avoid further engine management problems.

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code **P1190**	HO2S Heater Circuit Low Resistance (upstream sensor)	Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A7
		If fault not found, switch ignition on and proceed to pinpoint test A1

Pinpoint Tests

	TEST STEP	RESULT	ACTION
	Note: Do not attempt to test resistance between sensor pins 3 and 4 as the current generated by a multimeter may damage the platinum electrodes		
A1	Check each upstream sensor heater resistance is within limits of **5.3 – 6.7Ω**	OK	Proceed to A2
		Out–of–limits	Renew sensor, re–connect harness and proceed to **A7**
A2	Check harness continuity PI **128/003** to PI **129/003**	OK	Proceed to **A3**
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A7
A3	Check harness continuity PI **128/003** to PI **104/030**	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to **A7**
A4	Check harness continuity PI **128/004** to RS **006/008**	OK	Proceed to **A5**
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to **A7**
A6	Check harness continuity PI **129/004** to RS **006/008**	OK	Renew sensors, re–connect harness and proceed to **A7**
		Short circuit	Locate and rectify wiring fault, re–connect harness, reconnect harness and proceed to **A7**
A7	Clear fault and perform service drive cycle to verify fault cleared	OK	Stop
		Fault still present	Proceed to **A8**
A8	Return to Symptom Chart and repeat diagnostic procedure	OK	Stop
		Fault still present	Contact Jaguar Service Hotline

5.1

HEATED OXYGEN SENSORS – P1191

Note: Due to software configuration it is necessary to test both downstream sensors during fault diagnosis. Ensure that sensors are re-connected correctly to avoid further engine management problems.

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1191	HO2S Heater Resistance (downstream sensor)	Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A7
		If fault not found, disconnect both downstream sensors and proceed to pinpoint test A1

Pinpoint Tests

	TEST STEP	RESULT	ACTION
	Note: Do not attempt to test resistance between sensor pins **3** and **4** as the current generated by a multimeter may damage the platinum electrodes		
A1	Check each downstream sensor heater resistance is within limits of **5.3 – 6.7Ω**	OK	Proceed to **A2**
		Out-of-limits	Renew sensors, re-connect harness and proceed to **A7**
A2	Check harness continuity PI **126/003** to PI **127/003**	OK	Proceed to **A3**
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to **A7**
A3	Check harness continuity PI **126/003** tp PI **104/004**	OK	Proceed to **A4**
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to **A7**
A4	Check harness continuity PI **126/004** to RS **006/008**	OK	Proceed to **A5**
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to **A7**
A5	Check harness continuity PI **127/004** to **RS 006/008**	OK	Proceed to **A6**
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to **A7**
A6	Check harness insulation PI **126/003** to ground	OK	Renew sensors, re-connect harness and proceed to **A7**
		Short circuit	Locate and rectify wiring fault, re-connect harness, reconnect harness and proceed to **A7**
A7	Clear fault and perform service drive cycle to verify fault cleared	**OK**	stop
		Fault still present	Proceed to **A8**
A8	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1192	HO2S Heater Short Circuit (downstream sensor)	Switch ignition off
		Check harness and connector condition ▌ integrity, if faulty rectify and proceed to pinpoint test A3
		If fault not found, disconnect both downstream sensors and proceed to pinpoint test A I

Pinpoint Tests

	TEST STEP	RESULT	ACTION
	Note: Do not attempt to test resistance between sensor pins 3 and 4 as the current generated by a multimeter may damage the platinum electrodes		
A I	Check each downstream sensor heater resistance is within limits of 5.3 – 6.7Ω	OK	Proceed to A2
		Out–of–limits	Renew sensor, re–connect harness and proceed to A3
A2	Check voltage reading 0 PI 1261003 and PI 1271003 to Vbatt	OV	Renew sensors, re–connect harness and proceed to A3
		Above OV	Locate and rectify wiring fault, re–connect harness, reconnect harness and proceed to A3
A3	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A4
A4	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

HEATED OXYGEN SENSORS – P1193

Note: Due to software configuration it is necessary to test both downstream sensors during fault diagnosis. Ensure that sensors are reconnected correctly to avoid further engine management problems.

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1193	HO2S Heater Open Circuit (downstream sensor)	Switch ignition off
		Check harness and connector condition ▮ integrity, if faulty rectify and proceed to pinpoint test A7
		If fault not found, disconnect both downstream sensors and proceed to pinpoint test A I

Pinpoint Tests

TEST STEP		RESULT	ACTION
A I	Check each downstream sensor heater resistance is within limits of 5.3 – 6.7Ω	OK	Proceed to A2
		Out-of-limits	Renew sensor, reconnect harness and proceed to A7
A2	Check harness continuity PI 1261003 to PI 1271003	OK	Switch off ignition and proceed to A3
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A7
A3	Check harness continuity PI 126/001 to PI 1041004	**OK**	Proceed to A4
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A7
A4	Check harness continuity PI 126/004 to RS 0061008	OK	Proceed to A5
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A7
A5	Check harness continuity PI 127/004 to RS 0061008	OK	Proceed to A6
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A7
A6	Check harness insulation PI 126/003 to ground	OK	Reconnect harness and proceed to A7
		Short circuit	Locate and rectify wiring fault, reconnect harness and proceed to A7
A7	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A8
A8	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

HEATED OXYGEN SENSORS – P1194

Note: Due to software configuration it is necessary to test both downstream sensors during fault diagnosis. Ensure that sensors are re-connected correctly to avoid further engine management problems.

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1194	HO2S Heater Resistance (downstream sensor)	Switch ignition off
		Check harness and connector condition ▮ integrity, if faulty rectify and proceed to pinpoint test A7
		If fault not found, disconnect both downstream sensors and proceed to pinpoint test A I

Pinpoint Tests

	TEST STEP	RESULT	ACTION
	Note: Do not attempt to test resistance between sensor pins 3 and 4 as the current generated by a multimeter may damage the platinum electrodes		
A I	Check each downstream sensor heater resistance is within limits of 5.3 – 6.7Ω	OK	Proceed to A2
		Out-of-limits	Renew sensor, re-connect harness and proceed to A7
A2	Check harness continuity PI 1261003 to PI 1271003	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A7
A3	Check harness continuity PI 126/003 tp PI 104/004	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A7
A4	Check harness continuity PI 1261004 to RS 006/008	OK	Proceed to A5
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A7
A5	Check harness continuity PI 1271004 to RS 0061008	OK	Proceed to A6
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A7
A6	Check harness insulation PI 126/003 to ground	OK	Renew sensors, re-connect harness and proceed to A7
		Short circuit	Locate and rectify wiring fault, re-connect harness, reconnect harness and proceed to A7
A7	Clear fault and perform service drive cycle to verify fault cleared	OK	Stop
		Fault still present	Proceed to A8
A8	Return to Symptom Chart and repeat diagnostic procedure	OK	Stop
		Fault still present	Contact Jaguar Service Hotline

HEATED OXYGEN SENSORS – P1195

Note: Due to software configuration it is necessary to test both downstream sensors during fault diagnosis. Ensure that sensors are reconnected correctly to avoid further engine management problems.

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1195	HO2S Heater Circuit Low Resistance (downstream sensor)	Switch ignition off
		Check harness and connector condition ▌ integrity, if faulty rectify and proceed to pinpoint test A7
		If fault not found, disconnect both downstream sensors and proceed to pinpoint test A I

Pinpoint Tests

	TEST STEP	RESULT	ACTION
	Note: Do not attempt to test resistance between sensor pins 3 and 4 as the current generated by a multimeter may damage the platinum electrodes		
A I	Check each downstream sensor heater resistance is within limits of 5.3 – 6.7Ω	OK	Proceed to A2
		Out–of–limits	Renew sensor, reconnect harness and proceed to A7
A2	Check harness continuity PI 1261003 to PI 1271003	**OK**	Proceed to A3
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A7
A3	Check harness continuity PI 126/003 to PI 1041004	**OK**	Proceed to A4
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A7
A4	Check harness continuity PI 1261004 to RS 0061008	OK	Proceed to A5
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A7
A5	Check harness continuity PI 1271004 to RS 0061008	OK	Renew sensors, re-connect harness and proceed to A6
		Short circuit	Locate and rectify wiring fault, reconnect harness and proceed to A7
A6	Check harness insulation PI 1271004 to ground	OK	Reconnect harness and proceed to A7
		Short circuit	Locate and rectify wiring fault, reconnect harness, reconnect harness and proceed to A7
A7	Clear fault and perform service drive cycle to verify fault cleared	**OK**	stop
		Fault still present	Proceed to A8
A8	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

HEATED OXYGEN SENSORS – P1196

Note: Due to software configuration it is necessary to test both downstream sensors during fault diagnosis. Ensure that sensors are re-connected correctly to avoid further engine management problems.

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1196	HO2S Heater Circuit Low Resistance (downstream sensor)	Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A6
		If fault not found, switch ignition on and proceed to pinpoint test A I

Pinpoint Tests

	TEST STEP	RESULT	ACTION
A1	Check each downstream sensor heater resistance is within limits of 5.3 – 6.7Ω	OK	Proceed to A2
		Out-of-limits	Renew sensor, re-connect harness and proceed to A6
A2	Check harness continuity PI 126/003 to PI 127/003	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A3	Check harness continuity PI 126/003 to PI 104/004	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A4	Check harness continuity PI 126/004 to RS 006/008	OK	Proceed to A5
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A5	Check harness continuity PI 127/004 to RS 006/008	OK	Renew sensors, re-connect harness and proceed to A6
		Open circuit	Locate and rectify wiring fault, re-connect harness, reconnect harness and proceed to A6
A6	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A7
A7	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaauar Service Hotline

5.1

INJECTORS- P0201, P0202, P0203, P0204, P0205, P0206

The following table details harness connector information for each of the six injectors and the corresponding GEMS ECM connector. Reference to this table is necessary when using the diagnostic procedures below.

Fault Code	Injector No.	Injector Harness Connections		
		Pin 1	Pin 2	GEMS ECM
P0201	**1**	PI 120/001	PI 120/002	PI 104/002
P0202	**2**	PI 121/001	PI 121/002	PI 104/015
P0203	**3**	PI 122/001	PI 122/002	PI 104/014
P0204	**4**	PI 123/001	PI 123/002	PI 104/013
P0205	**5**	PI 124/001	PI 124/002	PI 104/027
P0206	**6**	PI 125/001	PI 125/002	PI 104/025

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0201 - P0206	Injector Circuit, Cylinder **1 - 6**	Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test **A7**
		If fault not found, disconnect suspect injector and Proceed to pinpoint test **A I**

5.1

Pinpoint Tests

TEST STEP		RESULT	ACTION
A1	Check suspect injector resistance is within limits of **15.55 - 16.25Ω**	OK	Proceed to **A2**
		Out-of-limits	Renew injector, re-connect harness and proceed to **A7**
A2	Check harness continuity injector pin **1** connector to PI **119/005**	OK	Proceed to **A3**
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to **A7**
A3	Check harness continuity injector pin **2** connector to GEMS ECM	**OK**	Proceed to **A4**
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to **A7**
A4	Check harness insulation injector pin 2 connector to ground	OK	Proceed to **A5**
		Short circuit	Locate and rectify wiring fault, reconnect harness and proceed to **A7**
A5	Check voltage reading 0 injector pin 2 connector to Vbatt	**0V**	Disconnect and remove EMS control relay, re-connect injector under test and proceed to **A6**
		Above OV	Locate and rectify wiring fault, re-connect harness, reconnect harness and proceed to **A7**
A6	Disconnect PI **104** multi-plug from GEMS ECM, switch ignition ON and connect a multi-meter (on voltage scale) between ground (-ve probe) and ECM injector connection	OV	Reconnect EMS relay and harness and proceed to **A7**
		Vbatt	Locate and rectify wiring fault, re-connect harness, reconnect EMS relay and harness and proceed to **A7**
A7	Clear fault and perform service drive cycle to verify fault cleared	**OK**	stop
		Fault still present	Proceed to **A8**
A8	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

INJECTORS – P1201, P1202, P1203, P1204, P1205, P1206

The following table details harness connector information for each of the six injectors and the corresponding GEMS ECM connector. Reference to this table is necessary when using the diagnostic procedures below.

Fault Code	Injector No.	Injector Harness Connections		
		Pin 1	Pin 2	GEMS ECM
P1201	**1**	PI 120/001	PI 120/002	PI 104/002
P1202	**2**	PI 121/001	PI 121/002	PI 104/015
P1203	**3**	PI 122/001	PI 122/002	PI 104/014
P1204	**4**	PI 123/001	PI 123/002	PI 104/013
P1205	**5**	PI 124/001	PI 124/002	PI 104/027
P1206	**6**	PI 125/001	PI 125/002	PI 104/025

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1201 – P1206	Injector Circuit, Cylinder 1 – 6	Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A7
		If fault not found, disconnect suspect injector and Proceed to pinpoint test A I

Pinpoint Tests

TEST STEP		RESULT	ACTION
A I	Check suspect injector resistance is within limits of 15.55 – 16.25Ω	OK	Proceed to A2
		Out-of-limits	Renew injector, re-connect harness and proceed to A7
A2	Check harness continuity injector pin 1 connector to PI 119/005	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A7
A3	Check harness continuity injector pin 2 connector to GEMS ECM	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A7
A4	Check harness insulation injector pin 2 connector to ground	OK	Proceed to A5
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A7
A5	Check voltage reading 0 injector pin 2 connector to Vbatt	0V	Disconnect and remove EMS control relay, re-connect injector under test and proceed to A6
		Above 0V	Locate and rectify wiring fault, re-connect harness, reconnect harness and proceed to A7
A6	Disconnect PI 104 multi-plug from GEMS ECM, switch ignition ON and connect a multi-meter (on voltage scale) between ground (-ve probe) and ECM injector connection	0V	Re-connect EMS relay and harness and proceed to A7
		Vbatt	Locate and rectify wiring fault, re-connect harness, reconnect EMS relay and harness and proceed to A7
A7	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A8
A8	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

5.1

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0300	Random Misfire Detected	Proceed to pinpoint test **A I**

TEST STEP		RESULT	ACTION
A1	Check fuel pressure	OK	Proceed to **A2**
		Low	Rectify and proceed to **A4**
A2	Check for EGR Fault Code recorded	No	Proceed to **A3**
		Yes	Locate and rectify EGR fault and proceed to **A4**
A3	Check for fuel contamination	Clean	Proceed to **A4**
		Contaminated	Rectify fault and proceed to **A4**
A4	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to **A5**
A5	Return to Symptom Chart and repeat diagnostic procedure	**OK**	stop
		Fault still present	Contact Jaguar Service Hotline

MISFIRE – P0301, P0302, P0303, P0304, P0305, P0306

The following table details harness connector information for each of the six injectors, ignition coils and the corresponding GEMS ECM connector. Reference to this table is necessary when using the diagnostic procedures below.

Fault Code	Injector/ Coil No.	Injector Harness Connections			Ignition Coil Connections		
		Pin 1	Pin 2	GEMS ECM	Pin 1	Pin 2	GEMS ECM
P0301	**1**	Pl 120/001	Pl 120/002	Pl 104/002	Pl 131/001	Pl 131/001	Pl 104/010
P0302	**2**	Pl 121/001	Pl 121/002	Pl 104/015	Pl 132/001	Pl 132/002	Pl 104/008
P0303	**3**	Pl 122/001	Pl 122/002	Pl 104/014	Pl 133/001	Pl 133/002	Pl 104/006
P0304	**4**	Pl 123/001	Pl 123/002	Pl 104/013	Pl 134/001	Pl 134/002	Pl 104/005
P0305	**5**	Pl 124/001	Pl 124/002	Pl 104/027	Pl 135/001	Pl 135/002	Pl 104/009
P0306	**6**	Pl 125/001	Pl 125/002	Pl 104/025	Pl 136/001	Pl 136/002	Pl 104/011

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0301 – P0306	Misfire Detected, Cylinder 1 – 6	Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A7
		If fault not found, suspect injector and coil and proceed to pinpoint test A1

5.1

Pinpoint Tests

TEST STEP		RESULT	ACTION
A1	Check harness continuity injector pin 1 connector to Pl 119/005	OK	Proceed to A2
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A11
A2	Check harness continuity injector pin 2 connector to GEMS ECM	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A11
A3	Check harness insulation injector pin 2 connector to ground	OK	Proceed to A4
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A11
A4	Check harness insulation injector pin 1 connector to ground	OK	Proceed to A5
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A11
A5	Check harness insulation coil pin 1 connector to ground	OK	Proceed to A6
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A11
A6	Check harness insulation coil pin 2 connector to ground	OK	Proceed to A7
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A11
A7	Check spark plugs	OK	Proceed to A8
		Faulty	Rectify and proceed to A11
A8	Check injectors	OK	Proceed to A9
		Faulty	Rectify and proceed to A11
A9	Check suspect ignition coil	OK	Proceed to A10
		Faulty	Rectify and proceed to A11

Pinpoint Tests continued – P0301, P0302, P0303, P0304, P0305, P0306

A10	Check voltage reading 0 injector pin 2 connector and coil pin 1 connector to Vbatt	0V	Re-connect injector, coil and harness and proceed to **A11**
		Above 0V	Locate and rectify wiring fault, re-connect harness, re-connect injector, coil and harness and proceed to **A11**
A11	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to **A12**
A12	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

5.1

MISFIRE – P1313 / P1314

The following table details harness connector information for each of the six injectors, ignition coils and the corresponding GEMS ECM connector. Reference to this table is necessary when using the diagnostic procedures below.

Fault Code	Injector/ Coil No.	Injector Harness Connections			Ignition Coil Connections		
		Pin 1	Pin 2	GEMS ECM	Pin 1	Pin 2	GEMS ECM
P1313 to P1314	1	PI 120/001	PI 120/002	PI 104/002	PI 131/001	PI 131/001	PI 104/010
	2	PI 121/001	PI 121/002	PI 104/015	PI 132/001	PI 132/002	PI 104/008
	3	PI 122/001	PI 122/002	PI 104/014	PI 133/001	PI 133/002	PI 104/006
	4	PI 123/001	PI 123/002	PI 104/013	PI 134/001	PI 134/002	PI 104/005
	5	PI 124/001	PI 124/002	PI 104/027	PI 135/001	PI 135/002	PI 104/009
	6	PI 125/001	PI 125/002	PI 104/025	PI 136/001	PI 136/002	PI 104/011

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1313 – P1314	Misfire Rate – Catalyst Damage	Switch ignition off
		Disconnect injector and coil harness multi–plugs and proceed to pinpoint test A1

5.1

Pinpoint Tests

TEST STEP		RESULT	ACTION
A1	Check harness continuity from each injector pin 1 connector to PI 119/005	OK	Proceed to **A2**
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to **A13**
A2	Check harness continuity from each injector pin 2 connector to GEMS ECM connection	OK	Proceed to **A3**
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to **A13**
A3	Check harness continuity from each coil pin 1 connector to GEMS ECM connection	OK	Proceed to **A4**
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to **A13**
A4	Check harness continuity from each coil pin 1 connector to RS 001/010	OK	Proceed to **A5**
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to **A13**
A5	Check harness insulation from each injector pin 1 connector to ground	OK	Proceed to **A6**
		Short circuit	Locate and rectify wiring fault, re–connect harness and proceed to **A13**
A6	Check harness insulation from each injector pin 2 connector to ground	OK	Proceed to **A7**
		Short circuit	Locate and rectify wiring fault, re–connect harness and proceed to **A13**
A7	Check harness insulation from each coil pin 1 connector to ground	OK	Proceed to **A8**
		Short circuit	Locate and rectify wiring fault, re–connect harness and proceed to **A13**

Pinpoint Tests continued – P1313 / P1314

A8	Check harness insulation coil from each pin 2 to ground	OK	Proceed to A9
		Short circuit	Locate and rectify wiring fault, reconnect harness and proceed to A13
A9	Measure voltage between each injector pin 2 connector and PI 119/005	0V	Proceed to A10
		Vbatt	Locate and rectify wiring fault and proceed to A13
A10	Measure voltage between each coil pin 1 connector and PI 119/005	0V	Re-connect harness and proceed to A11
		Vbatt	Locate and rectify wiring fault, re-connect harness and proceed to A13
A11	Check fuel pump pressure is between 3 – 4 bar (absolute) and changes with engine load	OK	Proceed to A12
		Out-of limit	Rectify and proceed to A13
A12	Check for crankshaft position sensor fault code recorded	OK	Proceed to A13
		Faulty	Rectify and proceed to A13
A13	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A14
A14	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

5.1

MISFIRE– P1315

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1315	Persistent Misfire	Check for fault code P0301 – P0306 already recorded and rectify as necessary
		Clear code and perform service drive cycle to verify fault cleared
		If fault is still present contact Jaguar Service Hotline

MISFIRE – P1316

Fault Code	Injector/ Coil No.	Injector Harness Connections			Ignition Coil Connections		
		Pin 1	Pin 2	GEMS ECM	Pin 1	Pin 2	GEMS ECM
P1316	1	PI 120/001	PI 120/002	PI 104/002	PI 131/001	PI 131/001	PI 104/010
	2	PI 121/001	PI 121/002	PI 104/015	PI 132/001	PI 132/002	PI 104/008
	3	PI 122/001	PI 122/002	PI 104/014	PI 133/001	PI 133/002	PI 104/006
	4	PI 123/001	PI 123/002	PI 104/013	PI 134/001	PI 134/002	PI 104/005
	5	PI 124/001	PI 124/002	PI 104/027	PI 135/001	PI 135/002	PI 104/009
	6	PI 125/001	PI 125/002	PI 104/025	PI 136/001	PI 136/002	PI 104/011

5.1

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1316	Misfire Rate Above Limit	Switch ignition off
		Disconnect injector and coil harness multi–plugs and proceed to pinpoint test A I

Pinpoint Tests

TEST STEP		RESULT	ACTION
A I	Check harness continuity from each injector pin 1 connector to PI 119/005	OK	Proceed to A2
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A14
A2	Check harness continuity from each injector pin 2 connector to GEMS ECM connection	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A14
A3	Check harness continuity from each coil pin 1 connector to GEMS ECM connection	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A14
A4	Check harness continuity from each coil pin 1 connector to RS 001/010	OK	Proceed to A5
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A14
A5	Check harness insulation from each injector pin 1 connector to ground	OK	Proceed to A6
		Short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A14

Pinpoint Tests continued – P1315 / P1316

A6	Check harness insulation from each injector pin 2 connector to ground	OK	Proceed to A7
		Short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A14
A7	Check harness insulation from each coil pin 1 connector to ground	OK	Proceed to A8
		Short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A14
A8	Check harness insulation coil from each pin 2 to ground	OK	Proceed to A9
		Short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A14
A9	Measure voltage between each injector pin 2 connector and PI 119/005	0V	Proceed to A10
		Vbatt	Locate and rectify wiring fault and proceed to A14
A10	Measure voltage between each coil pin 1 connector and PI 119/005	0V	Proceed to A11
		Vbatt	Locate and rectify wiring fault and proceed to A14
A11	Check spark plugs	OK	Proceed to A12
		Faulty	Rectify and proceed to A14
A12	Check fuel pressure is between 3 – 4 bar and changes with engine load	OK	Proceed to A14
		Out–of limit	Rectify and proceed to A14
A13	Check for fuel contamination	OK	Proceed to A14
		Impure	Rectify and proceed to A14
A14	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A15
A15	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

5.1

KNOCK SENSORS – P0326 / P0331

Symptom Chart

CONDITION	POSSIBLE SOURCE		ACTION
Fault code P0326	Bank A	Circuit Range / Performance Fault	Proceed to pinpoint test A I
Fault code P0331	Bank B		

Pinpoint Tests

TEST STEP		RESULT	ACTION
A I	Check coolant level	OK	Proceed to A2
		Low	Top–up and proceed to A6
A2	Check fuel grade	OK	Proceed to A3
		Incorrect	Renew fuel and proceed to A6
A3	Check compression (refer to Engine Service Manual	OK	Proceed to A4
		Incorrect	Rectify and proceed to A6
A4	Check for abnormal oil consumption and / or cylinder deposits	OK	Proceed to A5
		Faulty	Rectify and proceed to A6
A5	Check harness and connector condition / integrity	OK	Proceed to A6
		Faulty	Rectify and proceed to A6
A6	Clear fault and perform service drive cycle to verify fault cleared	OK	Stop
		Fault still present	Proceed to A7
A7	Return to Symptom Chart and repeat diagnostic procedure	OK	Stop
		Fault still present	Contact Jaguar Service Hotline

Fault Code	Knock Sensor Bank	Knock Sensor Connections			
		Signal		Ground	
		Sensor Pin 1	GEMS ECM	Sensor Pin 2	GEMS ECM
P0327	A	PI 108/001	PI 105/021	PI 108/002	PI 105/009
P0332	B	PI 109/001	PI 105/032	PI 109/002	PI 105/009

CONDITION	POSSIBLE SOURCE		ACTION
Fault code P0327 Fault code P0332	Bank A Bank B	Circuit Low Input	Check suspect sensor is securely mounted, if faulty rectify and proceed to pinpoint test A3
			If fault not found disconnect suspect sensor proceed to pinpoint test A I

5.1

Pinpoint Tests

TEST STEP		RESULT	ACTION
A I	Check harness continuity sensor pin 1 to GEMS ECM connection	OK	Proceed to A2
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A3
A2	Check harness continuity sensor pin 2 to GEMS ECM connection	OK	Fit new sensor, re-connect harness and proceed to A3
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A3
A3	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A4
A4	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

KNOCK SENSORS – P0328 / P0333

Symptom Chart

CONDITION	POSSIBLE SOURCE		ACTION
Fault code **P0328** Fault code **P0333**	Bank **A** Bank B	Circuit High Input Fault	Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test **A3**
			If fault not found renew suspect sensor, clear fault code and perform service drive cycle to verify fault cleared
			If fault still present contact Jaguar Service Hotline

Pinpoint Tests

	TEST STEP	RESULT	ACTION
A1	Check harness continuity sensor pin **1** to GEMS ECM connection	OK	Proceed to **A2**
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to **A3**
A2	Check harness continuity sensor pin 2 to GEMS ECM connection	OK	Fit new sensor, re-connect harness and proceed to **A3**
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to **A3**
A3	Clear fault and perform service drive cycle to verify fault cleared	OK	Stop
		Fault still present	Proceed to **A4**
A4	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

5.1

CRANKSHAFT POSITION SENSOR – P0335

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0335	CKP Circuit Fault	Check CKP is securely mounted, if faulty rectify and proceed to pinpoint test A5
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A5
		If fault not found disconnect suspect sensor proceed to pinpoint test A1

Pinpoint Tests

TEST STEP		RESULT	ACTION
A1	Check reluctor ring is secure on crank	OK	Disconnect CKP and proceed to A2
		Faulty	Repair or renew sensor, re–connect harness and proceed to A5
A2	Check harness continuity PI 111/001 to PI 1041025	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A5
A3	Check harness continuity PI 111/002 PI 104/026	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A5
A4	Check harness insulation PI 111/001 to ground	OK	Renew CKP, re–connect harness and proceed to A5
		Short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A5
A5	Clear fault and perform service drive cycle to verify fault cleared	OK	Stop
		Fault still present	Proceed to A6
A6	Return to Symptom Chart and repeat diagnostic procedure	OK	Stop
		Fault still present	Contact Jaguar Service Hotline

5.1

CRANKSHAFT POSITION SENSOR - P0336

symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0336	CKP Range / Performance Fault	Proceed to pinpoint test AI

Pinpoint Tests

TEST STEP		RESULT	ACTION
A1	Check reluctor ring for damage	OK	Proceed to A2
		Faulty	Repair or renew CKP, re-connect harness and proceed to A4
A2	Check reluctor ring for magnetic debris	OK	Proceed to A3
		Contaminated	Clean or renew and proceed to A4
A3	Check harness and connectors for condition / integrity	OK	Proceed to A4
		Faulty	Repair or renew, re-connect and proceed to A4
A4	Clear fault and perform service drive cycle to verify fault cleared	OK	Stop
		Fault still present	Proceed to A5
A5	Return to Symptom Chart and repeat diagnostic procedure	OK	Stop
		Fault still present	Contact Jaguar Service Hotline

5.1

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0340	CMP Circuit Fault	Proceed to pinpoint test A I

TEST STEP		RESULT	ACTION
A1	Check harness and connectors for condition / integrity	**OK**	Proceed to A2
		Faulty	Repair or renew CMP, re-connect harness and proceed to A4
A2	Check CMP alignment	**OK**	Proceed to A3
		Misaligned	Adjust or renew, re-connect harness and proceed to A4
A3	Check for CMP tooth damage	**OK**	Renew CMP, re-connect harness and proceed to A4
		Faulty	Repair or renew, re-connect harness and proceed to A4
A4	Clear fault and perform service drive cycle to verify fault cleared	**OK**	stop
		Fault still present	Proceed to A5
A5	Return to Symptom Chart and repeat diagnostic procedure	**OK**	stop
		Fault still present	Contact Jaguar Service Hotline

IGNITION COILS- P1361, P1362, P1363, P1364, P1365, P1366

The following table details harness connector information for each of the six ignition coils and the corresponding GEMS ECM connector. Reference to this table is necessary when using the diagnostic procedures below.

Fault Code	Injector/ Coil No.	Ignition Coil Connections		GEMS ECM Connections
		Pin 1	Pin 2	
P1361	**1**	PI 131/001	PI 131/001	PI 104/010
P1362	**2**	PI 132/001	PI 132/002	PI 104/008
P1363	**3**	PI 133/001	PI 133/002	PI 104/006
P1364	**4**	PI 134/001	PI 134/002	PI 104/005
P1365	**5**	PI 135/001	PI 135/002	PI 104/009
P1366	**6**	PI 136/001	PI 136/002	PI 104/011

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1361 - P1366	No Activation, Cylinder 1 - 6	Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A7
		If fault not found, t t i iti coil and proceed to pinpoint test A1

5.1

Pinpoint Tests

TEST STEP		RESULT	ACTION
A1	Check ignition coil resistance is 0.75Ω	OK	Proceed to A2
		Incorrect	Renew coil, re-connect harness and proceed to A6
A2	Check harness continuity coil pin 1 connector to GEMS ECM	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A3	Check harness continuity coil pin 2 connector to RS 001/010	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A4	Check harness insulation coil pin 1 connector to ground	OK	Proceed to A5
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A5	Check harness insulation coil pin 2 connector to ground	OK	Proceed to A6
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A6	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A7
A7	Return to Symptom Chart and repeat diagnostic procedure	**OK**	stop
		Fault still present	Contact Jaguar Service Hotline

IGNITION COILS – P1371, P1372, P1373, P1374, P1375, P1376

The following table details harness connector information for each of the six ignition coils and the corresponding GEMS ECM connector. Reference to this table is necessary when using the diagnostic procedures below.

Fault Code	Injector/ Coil No.	Ignition Coil Connections		GEMS ECM Connections
		Pin 1	Pin 2	
P1371	**1**	PI 131/001	PI 131/001	PI 104/010
P1372	**2**	PI 132/001	PI 132/002	PI 104/008
P1373	**3**	PI 133/001	PI 133/002	PI 104/006
P1374	**4**	PI 134/001	PI 134/002	PI 104/005
P1375	**5**	PI 135/001	PI 135/002	PI 104/009
P1376	**6**	PI 136/001	PI 136/002	PI 104/011

Symptom Chart

5.1

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1371 – P1376	Early Activation, Cylinder 1 – 6	Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A7
		If fault not found, disconnect suspect ignition coil and proceed to pinpoint test A1

Pinpoint Tests

TEST STEP		RESULT	ACTION
A1	Check ignition coil resistance is 0.75Ω	OK	Proceed to A2
		Incorrect	Renew coil, re-connect harness and proceed to A6
A2	Check harness continuity coil pin 1 connector to GEMS ECM	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A6
A3	Check harness continuity coil pin 2 connector to RS 001/010	OK	Disconnect harness plug PI 104 and proceed to A4
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A4	Check harness insulation coil pin 1 connector to ground	OK	Proceed to A5
		Short circuit	Locate and rectify wiring fault, reconnect harness and proceed to A6
A5	Check harness insulation coil pin 2 connector to ground	OK	Proceed to A6
		Short circuit	Locate and rectify wiring fault, reconnect harness and proceed to A6
A6	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A7
A7	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

EXHAUST GAS RECIRCULATION – P0400

symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0400	EGR Flow or Function Sensor – Open Circuit Fault	Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A7
		Ensure EGR sensor is securely fitted
		If fault not found, disconnect EGR sensor and proceed to pinpoint test A I

Pinpoint Tests

TEST STEP		RESULT	ACTION
A I	Check sensor voltage / engine temp in accordance with curve shown on P64	OK	Proceed to A2
		Out-of-range	Renew sensor, re-connect harness and proceed to A6
A2	Check harness continuity PI 1101001 to PI 1051003	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A3	Check harness continuity PI 110/002 to PI 1051030	OK	Disconnect harness plug PI **104** and proceed to A4
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A4	Check for gas leak or blockage	OK	Proceed to A5
		Faulty	Locate and rectify pipework fault and proceed to A6
A5	Check for IAT, TP or MAFS fault codes recorded	OK	Proceed to A6
		Faulty	Rectify and proceed to A6
A6	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A7
A7	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

5.1

EXHAUST GAS RECIRCULATION – P1400

symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1400	EGR Valve – Position Control Fault	Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A9
		If fault not found, disconnect EGR valve and proceed to pinpoint test A I

Pinpoint Tests

	TEST STEP	RESULT	ACTION
A1	Check harness continuity PI 117/004 to PI 105/011	OK	Proceed to A2
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A9
A2	Check harness continuity PI 117/003 to PI 105/015	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A9
A3	Check harness continuity PI 117/002 to PI 105/007	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A9
A4	Check harness insulation PI 117/003 to PI 1171002	OK	Proceed to A5
		Full or partial short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A9
A5	Check harness insulation PI 117/003 to PI 117/004	OK	Proceed to A6
		Full or partial short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A9
A6	Check harness insulation PI 117/003 to PI 117/005	OK	Proceed to A7
		Full or partial short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A9
A7	Check for valve blockage or seizure	OK	Proceed to A8
		Faulty	Repair or renew and proceed to A9
A8	Check for IAT, TP or MAFS fault codes recorded	OK	Proceed to A9
		Faulty	Rectify and proceed to A9
A9	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A10
A10	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

EXHAUST GAS RECIRCULATION – P1401

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1401	**EGR** Valve – Position Circuit Fault	Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A9
		If fault not found, disconnect **EGR** valve and proceed to pinpoint test A I

Pinpoint Tests

TEST STEP		RESULT	ACTION
A I	Check harness continuity PI 117/004 to PI 105/011	OK	Proceed to A2
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A9
A2	Check harness continuity PI 117/003 to PI 105/015	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A9
A3	Check harness continuity PI 117/002 to PI 105/00	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A9
A4	Check voltage reading 0 PI 117/002 to Vbatt	OV	Proceed to A5
		Above OV	Locate and rectify wiring fault, re-connect harness and proceed to A9
A5	Check harness insulation PI 117/003 to PI 119/005	OK	Proceed to A6
		Full or partial short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A9
A6	Check harness insulation PI 117/003 to PI 119/005	OK	Proceed to A7
		Full or partial short circuit	Locate and rectify wiring fault, re-connect harness and-proceed to A9
A7	Check harness insulation PI 117/004 to PI 119/005	OK	Proceed to A8
		Full or partial short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A9
A8	Check for valve blockage or seizure	OK	Proceed to A9
		Faulty	Repair or renew and proceed to A9
A9	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A10
A10	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

5.1

EXHAUST GAS RECIRCULATION – P1408

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1408	EGR Flow or Function Sensor Fault	Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A4
		If fault not found, disconnect EGR sensor and proceed to pinpoint test A I

Pinpoint Tests

TEST STEP		RESULT	ACTION
A1			
A2	Check harness insulation PI 110/002 to PI 119/005	OK	Proceed to A3
		Full or partial short circuit	Locate and rectify wiring fault, reconnect harness and proceed to A4
A3	Check harness insulation PI 110/001 to ground	OK	Renew valve and proceed to A4
		Full or partial short circuit	Locate and rectify pipework fault and proceed to A4
A4	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A5
A5	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaauar Service Hotline

EXHAUST GAS RECIRCULATION – P1409

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1409	EGR Valve Circuit Fault	Switch ignition off
		Check harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A4
		If fault not found, disconnect EGR valve and proceed to pinpoint test A I

Pinpoint Tests

TEST STEP		RESULT	ACTION
A I	Check harness continuity PI 117/001 to PI 104/035	OK	Proceed to A2
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A4
A2	Check harness continuity PI 1171005 to PI 1191005	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to A4
A3	Check EGR solenoid resistance i: i limits of 7.8 – 8.6Ω	OK	Proceed to A4
		Out-of-limits	Renew valve and proceed to A4
A4	Clear ult and perform ser dri y to verify fault cleared	OK	Stop
		Fault still present	Proceed to A5
A5	Return to Symptom Chart an r diagnostic procedure	OK	Stop
		Fault still present	Contact Jaguar Service Hotline

5.1

SECONDARY AIR INJECTION SYSTEM – P0411

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0411	Insufficient Air Flow	Switch ignition off
		Check pump and relay harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A9
		Check AIR pipe for blockage or leakage, if faulty rectify and proceed to pinpoint test **A9**
		If fault not found, disconnect **AIR** harness and relay and proceed to pinpoint test A I

Pinpoint Tests

5.1

TEST STEP		RESULT	ACTION
A I	Check harness continuity PI 061/013 to PI 1461003	OK	Proceed to A2
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A9
A2	Check harness continuity PI 146/005 to PI 115/001	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A9
A3	Check harness continuity PI 146/005 to PI 115/002	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A9
A4	Check harness continuity PI 115/003 to ground	OK	Proceed to A5
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A9
A5	Check harness continuity PI 001/004 to PI 1461002	OK	Proceed to A6
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A9
A6	Check harness continuity PI 115/003 to PI 104/007	OK	Proceed to A7
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A9
A7	Check **AIR** relay operation	OK	Proceed to A8
		Faulty	Renew relay, reconnect harness and proceed to **A9**
A8	Check **AIR** pump is permanently off	No	Proceed to **A9**
		Yes	Renew pump, reconnect harness and proceed to **A9**
A9	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to **A10**
A10	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

SECONDARY AIR INJECTION SYSTEM – P0413

symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code **P0413**	Air Switching Valve – Open Circuit	Switch ignition off
		Check pump and relay harness and connector condition / integrity, if faulty rectify and proceed to pinpoint test A7
		If fault not found, disconnect AIR harness and relay and proceed to pinpoint test A1

Pinpoint Tests

TEST STEP		RESULT	ACTION
A I	Check air pump relay operation	OK	Disconnect and proceed to A2
		Faulty	Renew relay, re–connect harness and proceed to A7
A2	Check harness continuity RS 006/004 to PI **061/013**	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to **A7**
A3	Check harness continuity PI **0611013** to PI **1461003**	OK	Proceed to **A4**
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to **A7**
A4	Check harness continuity PI **1461005** to PI **115/001**	**OK**	Proceed to **A5**
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to **A7**
A5	Check harness continuity PI **146/005** to PI **1151002**	OK	Proceed to **A6**
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to **A7**
A6	Check harness continuity PI **1151003** to PI **1041007**	**OK**	Fit new **AIR** relay, re–connect harness and proceed to **A7**
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to **A7**
a7	Clear fault and perform service drive cycle to verify fault cleared	OK	Stop
		Fault still present	Proceed to A8
A8	Return to Symptom Chart and repeat diagnostic procedure	OK	Stop
		Fault still present	Contact Jaguar Service Hotline

5.1

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0414	Air Switching Valve – Short Circuit	Switch ignition off
		If fault not found, disconnect AIR relay and proceed to pinpoint test A I

TEST STEP		RESULT	ACTION
A I	Check harness insulation PI 146/001 to ground	OK	Proceed to A2
		Short circuit	Locate and rectify wiring fault, reconnect harness and proceed to A7
A2	Check harness insulation PI 146/002 to ground	OK	Proceed to A3
		Short circuit	Locate and rectify wiring fault, reconnect harness and proceed to A7
A3	Check harness insulation PI 146/003 to ground	OK	Proceed to A4
		Short circuit	Locate and rectify wiring fault, reconnect harness and proceed to A7
A4	Check harness insulation PI 146/005 to ground	OK	Proceed to A5
		Short circuit	Locate and rectify wiring fault, reconnect harness and proceed to A7
A5	Check voltage PI 146/001 to Vbatt	OV	Fit new AIR relay, re-connect harness and proceed to A6
		Above OV	Locate and rectify wiring fault, reconnect harness and proceed to A7
A6	Check voltage PI 146/005 to Vbatt	OV	Renew AIR relay, reconnect harness and proceed to A7
		Above OV	Locate and rectify wiring fault, re-connect harness and proceed to A7
A7	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A8
A8	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

CATALYST SYSTEM EFFICIENCY – P0420

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0420	Catalyst Efficiency Low – A Bank	Check for exhaust leaks, if found repair or renew pipework and proceed to pinpoint test A11
		Check for inlet air leak, if found repair or renew pipework and proceed to pinpoint test A11
		If fault not found, disconnect both upstream HO2S sensors and proceed to pinpoint test A1

Pinpoint Tests

TEST STEP		RESULT	ACTION
A1	Check harness continuity PI **128/001** to PI **105/008**	OK	Proceed to A2
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to **A11**
A2	Check harness continuity PI **128/002** to PI **105/006**	OK	Proceed to **A3**
		Open circuit	Locate and rectify wiring fault, re-connect harness and proceed to **A11**
A3	Check harness insulation PI **129/00** to PI **105/008**	OK	Proceed to **A4**
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to **A11**
A4	Check harness insulation PI **129/002** to PI **105/019**	OK	Proceed to **A5**
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to **A11**
A5	Check harness insulation PI **128/002** to ground	0V	Fit new **AIR** relay, re-connect harness and proceed to **A6**
		Full or partial short circuit	Locate and rectify wiring fault, re-connect harness and proceed to **A11**
A6	Check harness insulation PI **129/002** to ground	0V	Renew **AIR** relay, re-connect harness and proceed to **A7**
		Full or partial short circuit	Locate and rectify wiring fault, re-connect harness and proceed to **A11**
A7	Check harness insulation PI **128/00** to RS **006/008**	OK	Proceed to **A8**
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to **A11**
A8	Check harness insulation PI **128/002** to RS **006/008**	OK	Proceed to **A9**
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to **A11**
A9	Check harness insulation PI **129/001** to **RS 006/008**	OK	Proceed to **A10**
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to **A11**

5.1

Pinpoint Tests continued – P0420

A10	Check harness continuity PI 129/002 to RS 006/008	**OK**	Fit new upstream HO2S sensors and catalyst, reconnect harness and proceed to A I 1
		Short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A11	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A I2
A12	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

CATALYST SYSTEM EFFICIENCY – P0430

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0430	Catalvst Efficiencv Low – B Bank	Check for exhaust leaks, if found repair or renew pipework and proceed to pinpoint test A11
		Check for inlet air leak, if found repair or renew pipework and proceed to pinpoint test A11
		If fault not found, disconnect both upstream HO2S sensors and proceed to pinpoint test A I

Pinpoint Tests

TEST STEP		RESULT	ACTION
A I	Check harness continuity PI 128/001 to PI 105/008	OK	Proceed to A2
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A2	Check harness continuity PI 128/002 to PI 105/006	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A3	Check harness insulation PI 129/001 to PI 105/008	OK	Proceed to A4
		Full or partial short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A4	Check harness insulation PI 129/002 to PI 105/019	OK	Proceed to A5
		Full or partial short circuitt	Locate and rectify wiring fault, re–connect harness and proceed to A11
A5	Check harness insulation PI 128/002 to ground	0V	Proceed to A6
		Full or partial short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A6	Check harness insulation PI 129/002 to ground	0V	Proceed to A7
		Full or partial short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A7	Check harness insulation PI 128/001 to RS 0061008	OK	Proceed to A8
		Short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A8	Check harness insulation PI 128/002 to RS 006/008	OK	Proceed to A9
		Short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A9	Check harness insulation PI 129/001 to RS 006/008	OK	Proceed to A10
		Short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11
A10	Check harness continuity PI 129/002 to RS 006/008	OK	Fit new upstream HO2S sensors and catalyst and proceed to A I 1
		Short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A11

A11	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A12
A12	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

EVAPORATIVE EMISSION CONTROL - P0441

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0441	EVAP Purge Flow Fault	Proceed to pinpoint test A I

Pinpoint Tests

TEST STEP		RESULT	ACTION
A1	Check purge valve for siezure or blockage	OK	Proceed to A2
		Faulty	Renew and proceed to A4
A2	Check pipework for leaks	OK	Proceed to A3
		Faulty	Repair or renew and proceed to A4
A3	Check for pump running continuously	No	Proceed to A4
		Yes	Repair or renew pump and proceed to A4
A4	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A5
A5	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaauar Service Hotline

5.1

EVAPORATIVE EMISSION CONTROL – P0443

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0443	EVAP Purge Control – Valve Circuit Fault	Switch ignition off
		Check harness and connectors for condition / integrity, if faulty rectify and proceed to pinpoint test A6
		If fault not found, disconnect EVAP valve and proceed to pinpoint test A1

Pinpoint Tests

TEST STEP		RESULT	ACTION
A1	Check harness continuity PI 130/001 to PI 119/005	OK	Proceed to A2
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A6
A2	Check harness continuity PI 130/002 to PI 105/006	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, reconnect harness and proceed to A6
A3	Check harness insulation PI 130/001 to ground	OK	Proceed to A4
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A4	Check harness insulation PI 130/002 to ground	OK	Proceed to A5
		Short circuitt	Locate and rectify wiring fault, reconnect harness and proceed to A6
A5	Check harness insulation PI 130/001 to PI 130/002	OK	Proceed to A6
		Short circuit	Locate and rectify wiring fault, reconnect harness and proceed to A6
A6	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A7
A7	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

VEHICLE SPEED SENSOR - P0500

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0500	VSS fault	Disconnect VSS and proceed to pinpoint test A1

Pinpoint Tests

	TEST STEP	RESULT	ACTION
AI	Check harness continuity PI 105/028 to FC 010/003	OK	Proceed to A2
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A3
A2	Check VSS signal from ECM	OK	Proceed to A3
		Faulty	Renew sensor, reconnect harness and proceed to A3
A3	Clear fault and perform service drive cycle to verify fault cleared	OK	Stop
		Fault still present	Proceed to A4
A4	Return to Symptom Chart and repeat diagnostic procedure	OK	Stop
		Fault still present	Contact Jaguar Service Hotline

5.1

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P0506	ISC RPM Low Fault	Proceed to pinpoint test **A I**

TEST STEP		RESULT	ACTION
A1	Check blockages in valve drillings	OK	Proceed to **A2**
		Blocked	Repair or renew valve and proceed to **A7**
A2	Check stepper motor for seizure	OK	Proceed to **A3**
		Faulty	Repair or renew motor and proceed to **A7**
A3	Check valve is correctly fitted	OK	Proceed to **A4**
		Incorrect	Repair or renew and proceed to **A7**
A4	Check harness and connectors for condition / integrity	OK	Proceed to **A5**
		Faulty	Repair or renew and proceed to **A7**
A5	Start and run engine at idle spped, monitor Pid **10** ensuring value changes with throttle position	OK	Proceed to **A6**
		Incorrect	Renew throttle potentiometer. Contact Jaguar Service Hotline.

CONDITION	POSSIBLE SOURCE	ACTION
Fault code **P0507**	ISC RPM High Fault	Proceed to pinpoint test **A I**

Pinpoint Tests

TEST STEP		RESULT	ACTION
A1	Check base idle setting	**OK**	Proceed to **A2**
		Incorrect	Reset and proceed to **A8**
42	Check blockages in valve drillings	OK	Proceed to **A3**
		Blocked	Repair or renew valve and proceed to **A8**
43	Check stepper motor for seizure	**OK**	Proceed to **A4**
		Faulty	Repair or renew motor and proceed to **A8**
44	Check valve is correctly fitted	OK	Proceed to **A5**
		Incorrect	Repair or renew and proceed to **A8**
45	Check harness and connectors for condition / integrity	OK	Proceed to **A6**
		Faulty	Repair or renew and proceed **to A8**
46	Start and run engine at idle spped, monitor Pid **10** ensuring value changes with throttle position	OK	Proceed to **A7**
		Incorrect	Renew Throttle Potentiometer. Contact Jaguar Service Hotline

IDLE SPEED CONTROL – P1508

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1508	ISC Open Circuit Fault	Switch ignition off
		Check harness and connectors for condition / integrity, if faulty rectify and proceed to pinpoint test A7
		If fault not found disconnect ISC and proceed to pinpoint test A1

Pinpoint Tests

	TEST STEP	RESULT	ACTION
A1	Check harness continuity PI 113/001 to PI 104/003	OK	Proceed to A2
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A7
A2	Check harness continuity PI 113/002 to PI 104/016	OK	Proceed to A3
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A7
A3	Check harness continuity PI 113/003 to PI 104/028	OK	Proceed to A4
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A7
A4	Check harness continuity PI 113/004 to PI 104/029	OK	Proceed to A5
		Open circuitt	Locate and rectify wiring fault, re–connect harness and proceed to A7
A5	Check resistance ISC pin 1 to ISC pin 002 is within limits 40 – 60Ω	OK	Proceed to A6
		Out–of limits	Renew ISC re–connect harness and proceed to A7
A6	Check harness insulation ISC pin 3 to ISC pin 4	OK	Proceed to **A7**
		Out–of–limits	Renew ISC re–connect harness and proceed to **A7**
A7	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to **A8**
A8	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

IDLE SPEED CONTROL – P1509

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1509	ISC Short Circuit Fault	Switch ignition off
		Check harness and connectors for condition / integrity, if faulty rectify and proceed to pinpoint test A12
		If fault not found disconnect ISC and proceed to pinpoint test A I

Pinpoint Tests

TEST STEP		RESULT	ACTION
41	Check harness insulation PI 1131001 to PI 1131002	**OK**	Proceed to A2
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A12
42	Check harness insulation PI 113/001 to PI 113/003	**OK**	Proceed to A3
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A12
43	Check harness insulation PI 1131001 to PI 1131004	OK	Proceed to A4
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A12
44	Check harness insulation PI 1131002 to PI 1131003	**OK**	Proceed to A5
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A12
45	Check harness insulation PI 1131002 to PI 113/004	OK	Proceed to A6
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A12
46	Check insulation ISC pin 1 to ISC pin 2	OK	Proceed to A7
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A12
47	Check insulation ISC pin 1 to ISC pin 3	**OK**	Proceed to A8
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A12
48	Check insulation ISC pin **1** to ISC pin 4	OK	Proceed to A9
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A12
49	Check insulation ISC pin 2 to ISC pin 3	OK	Proceed to A10
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A12
A10	Check insulation ISC pin 2 to ISC pin 4	OK	Proceed to A I 1
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A12

5.1

Pinpoint Tests continued – P1509

A11	Check insulation ISC pin **3** to ISC pin **4**	OK	Proceed to **A12**
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to **A12**
A12	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to **A13**
A13	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

PARK/ NEUTRAL SWITCH – P1514

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1514	PNPS High Load Neutral / Drive Fault	Select 'D' (drive) position at transmission selector and check rotary switch illuminates on drive, if faulty rectify and proceed to pinpoint test A6
		Check harness and connectors for condition / integrity, if faulty rectify and proceed to pinpoint test A6
		If fault not found proceed to pinpoint test A I

Pinpoint Tests

	TEST STEP	RESULT	ACTION
A I	Check harness insulation CC 013/024 to ground	OK	Proceed to A2
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A2	Check harness insulation PI 063/005 to ground	OK	Proceed to A3
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A3	Check harness insulation PI 105/027 to ground	OK	Proceed to A4
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A4	Check harness insulation FC 002/020 to ground/003	OK	Proceed to A5
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A5	Check harness insulation FC 0071035 to ground	OK	Proceed to A6
		Short circuit	Locate and rectify wiring fault, re-connect harness and proceed to A6
A6	Clear fault and perform service drive cycle to verify fault cleared	OK	Stop
		Fault still present	Proceed to A7
A7	Return to Symptom Chart and repeat diagnostic procedure	OK	Stop
		Fault still present	Contact Jaguar Service Hotline

PARK/ NEUTRAL SWITCH – P1516

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code **P1516**	Gear Change Neutral / Drive Fault	Select 'D' (drive) position at transmission selector and check rotary switch illuminates on drive, if faulty rectify and proceed to pinpoint test **A6**
		Check harness and connectors for condition / integrity, if faulty rectify and proceed to pinpoint test **A6**
		If fault not found proceed to pinpoint test **A1**

Pinpoint Tests

TEST STEP		RESULT	ACTION
A1	Check harness insulation CC 013/024 to ground	OK	Proceed to A2
		Short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A6
A2	Check harness insulation PI 063/005 to ground	OK	Proceed to A3
		Short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A6
A3	Check harness insulation PI 105/027 to ground	OK	Proceed to A4
		Short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A6
A4	Check harness insulation FC 002/020 to ground/003	OK	Proceed to A5
		Short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A6
A5	Check harness insulation FC 007/035 to ground	OK	Proceed to A6
		Short circuit	Locate and rectify wiring fault, re–connect harness and proceed to A6
A6	Clear fault and perform service drive cycle to verify fault cleared	OK	Stop
		Fault still present	Proceed to A7
A7	Return to Symptom Chart and repeat diagnostic procedure	OK	Stop
		Fault still present	Contact Jaguar Service Hotline

PARK/ NEUTRAL SWITCH – P1517

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1517	Cranking Neutral / Drive Fault	Select 'N' (neutral) position at transmission selector and check rotary switch illuminates on neutral, if faulty rectify and proceed to pinpoint test A8
		Check harness and connectors for condition / integrity, if faulty rectify and proceed to pinpoint test A8
		If fault not found proceed to pinpoint test A I

Pinpoint Tests

	TEST STEP	RESULT	ACTION
A I	Check harness continuity CC 0131024 to PI 1051027	OK	Proceed to A2
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A8
A2	Check voltage level at CC 0131024	12 Volts	Switch ignition on and proceed to A3
		Below 12V	Locate and rectify wiring fault, re–connect harness and proceed to A8
A3	Check voltage level at CC 0131020 & 021	OV	Proceed to A4
		Above OV	Locate and rectify wiring fault, re–connect harness and proceed to A8
A4	Check decoder inputs from the rotary switch to the table above	OK	Proceed to A5
		Faulty	Reset rotary switch using special tool JD 161 and proceed to A8
A5	Check harness continuitv GB 0021002 to CC 013/013	OK	Proceed to A6
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A8
A6	Check harness continuity GB 0021003 to CC 013/011	OK	Proceed to A7
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A8
A7	Check harness continuity GB 0021004 to CC 013/012	OK	Proceed to A8
		Open circuit	Locate and rectify wiring fault, re–connect harness and proceed to A8
A8	Clear fault and perform service drive cycle to verify fault cleared	OK	Stop
		Fault still present	Proceed to A9
A9	Return to Symptom Chart and repeat diagnostic procedure	OK	Stop
		Fault still present	Contact Jaguar Service Hotline

5.1

CODES COMMON TO ECM AND TCM – P0605

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code **P0605**	Control Module Internal ROM Test Fault	Run service drive cycle and check TCM in default mode, if faulty rectify and proceed to pinpoint test **A2**
		Check harness and connectors for condition / integrity, if faulty rectify and proceed to pinpoint test **A2**
		If fault not found proceed to pinpoint test **A I**

TEST STEP		RESULT	ACTION
		Faulty	Renew and proceed to **A2**
A2	Clear fault and perform service drive cycle to verify fault cleared	**OK**	stop
		Fault still present	Proceed to **A3**
A3	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

CODES COMMON TO ECM AND TCM –P1775

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1775	MIL illumination request from TCM	Run service drive cycle and check TCM in default mode, if faulty rectify and proceed to pinpoint test A2
		Check harness and connectors for condition / integrity, if faulty rectify and proceed to pinpoint test A2
		If fault not found proceed to pinpoint test A I

Pinpoint Tests

TEST STEP		RESULT	ACTION
A I	Check TCM	**OK**	Proceed to A2
		Faulty	Renew and proceed to A2
A2	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A3
A3	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

CODES COMMON TO ECM AND TCM - P1776

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1776	Ignition Retard Request Duration Fault	Run engine for 20 seconds to check if TCM in substitute function (ie sport mode cannot be engaged), if faulty rectify and proceed to pinpoint test A4
		Check harness and connectors (ECM & TCM) for condition / integrity, if faulty rectify and proceed to pinpoint test A4
		If fault not found proceed to pinpoint test A I

TEST STEP		RESULT	ACTION
A1	Check harness continuity PI 105/026 to CC 007/032	OK	Proceed to A2
		Open Circuit	Locate and rectify wiring fault, re–connect harness and proceed to A4
A2	Check PWM signal using an oscilloscope, signal should be within limits of 10 - 19% (1.1 - 2.1ms)	OK	Proceed to A3
		Out–of–limits	Renew TCM and proceed to A4
A3	Check ECM for stored fault codes	OK	Proceed to A4
		Faulty	Renew ECM. Contact Jaguar Service Hotline

CODES COMMON TO ECM AND TCM - P1777

Symptom Chart

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1777	Ignition Retard Request Circuit Fault	Run engine for 20 seconds to check if TCM in substitute function (ie sport mode cannot be engaged), if faulty rectify and proceed to pinpoint test A4
		Check harness and connectors (ECM & TCM) for condition / integrity, if faulty rectify and proceed to pinpoint test A4
		If fault not found proceed to pinpoint test A1

Pinpoint Tests

TEST STEP		RESULT	ACTION
A I	Check harness continuity PI 105/026 to CC 007/032	OK	Proceed to A2
		Open Circuit	Locate and rectify wiring fault, re-connect harness and proceed to A4
A2	Check PWM signal using an oscilloscope, signal should be within limits of 10 - 19% (1.1 - 2.1ms)	OK	Proceed to A3
		Out-of-limits	Renew TCM and proceed to A4
A3	Interrogate ECM for stored fault codes	OK	Proceed to A4
		Faulty	Renew and proceed to A4
A4	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A5
A5	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline

5.1

CONDITION	POSSIBLE SOURCE	ACTION
Fault code P1794	System Voltage Fault	Proceed to pinpoint test A I

		RESULT	ACTION
A I	Run engine upto 2,000 revs to check if TCM in substitute function (ie sport mode cannot be engaged), if faulty rectify and proceed to pinpoint test A	OK	Proceed to A2
		Open Circuit	Locate and rectify wiring fault, reconnect harness and proceed to A6
A2	With engine running at 2,000 revs check battery terminal voltage	≥ 12v	Proceed to A3
		< 12v	Faulty charging system, rectify Switch ignition off disconnect TCM and proceed to A6
A3	With engine running at 2,000 revs check voltage at TCM connector pin 1	≥ 12v	Proceed to A4
		< 12v	Harness fault, locate, rectify and proceed to A6
A4	With engine running at 2,000 revs check TCM runs in default mode	Yes	Proceed to A5
		No	Check relay contacts for high resistance and proceed to A6
A5	Interrogate TCM for stored fault codes	OK	Proceed to A6
		Faulty	Renew TCM and proceed to A6
A6	Clear fault and perform service drive cycle to verify fault cleared	OK	stop
		Fault still present	Proceed to A7
A7	Return to Symptom Chart and repeat diagnostic procedure	OK	stop
		Fault still present	Contact Jaguar Service Hotline